

ORIGINAL ARTICLE

Report on the Hippolytidae Bate (*sensu lato*) from China seas

Peng Xu^{1,2}, Xin-Zheng Li^{1*}

¹Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, China

²University of Chinese Academy of Sciences, Beijing 100049, China

*Corresponding author, E-mail: lixzh@qdio.ac.cn

Abstract Thirty species belonging to 13 genera of three families in the Hippolytidae Bate, 1888 (*sensu lato*) are reported in the present paper, including two new species and two newly recorded ones from the China seas. The two new species are named as *Thinora leptochelus* **sp. nov.** and *Thor singularis* **sp. nov.** *Thinora leptochelus* **sp. nov.** differs from the only known species of the genus, *Thinora maldivensis* (Borradaile, 1915), by the developed supraorbital tooth and the slender and cone-shaped chelae of the first 2 pereopods. *Thor singularis* **sp. nov.** can be distinguished from the other members of the genus *Thor* by the first 2 pereopods with epipods. The two newly recorded species from China seas are *Eualus kikuchii* Miyake & Hayashi, 1967 and *Heptacarpus commensalis* Hayashi, 1979.

Key words Crustacea, Decapoda, Caridea, Hippolytidae, China seas, new species.

1 Introduction

The family Hippolytidae Bate, 1888 belongs to the superfamily Alpheoidea Rafinesque, 1815 (Holthuis, 1993; De Grave & Fransen, 2011). It is one of the largest families in Infraorder Caridea, currently contains over 330 species in 37 genera (De Grave & Fransen, 2011). This is a common shrimp group from coastal shallow waters such as marine environments of sea grass bed, mangroves, coral reefs, even fish cleaners, although some genera are deep-sea ones.

The monophyly of the family Hippolytidae has been questioned in recent decades (Christoffersen, 1979, 1987; Martin & Davis, 2001; De Grave *et al.*, 2014). Christoffersen (1987, 1990) divided the Hippolytidae (*sensu lato*, Holthuis, 1993) into seven families, proposed the re-recognition and/or erection of the families, and re-arranged them across two superfamilies: 1) his Barbouriidae Christoffersen, 1987, Lysmatidae Dana, 1852 and Merguidae Christoffersen, 1990 were arranged into the superfamily Crangonoidea (together with Processidae, Glyphocrangonidae and Crangonidae); 2) his Merhippolytidae Christoffersen, 1990, Nauticarididae Christoffersen, 1987, Alopidae Christoffersen, 1987, Bychocarididae Christoffersen, 1987, Thoridae Kingsley, 1879 and Hippolytidae Bate, 1888 (*sensu stricto*) were arranged into the superfamily Alpheoidea (together with Pterocarididae, Ogyrididae and Alpheidae). However, Christoffersen's (1987, 1990) classification scheme was not won favour with decapod workers (see discussion of Holthuis, 1993; Chace, 1997). This systematic controversy results from the much diversity of the morphology in the family (*sensu lato*). Recently, De Grave *et al.* (2014) studied the systematic relationships among the genera and the monophyletic status of the family Hippolytidae (*sensu lato*) using molecular phylogenetic analysis with two nuclear protein-coding genes, enolase and sodium-potassium ATPase α -subunit (NaK), and the mitochondrial 16S rRNA gene. Their result showed that the monophyletic status of the family Hippolytidae (*sensu lato*) is clearly rejected, because the alpheoid family Barbouriidae is in the hippolytid clade in their ML phylogenetic tree; the arrangement of Christoffersen (1987, 1990) which clustered the groups of Hippolytidae (*sensu lato*)

urn:lsid:zoobank.org:pub:EF4C535D-B77C-45E1-86BA-A3F7AA06ED18

Received 13 February 2015, accepted 23 March 2015

© Zoological Systematics, 40(2): 107–165

into two superfamilies, Alpheoidea and Crangonoidea, was not supported, because the monophyletic clade composed by the Hippolytidae and Barbouriidae formed a sister group of the clade including taxa of Pandalidae, Crangonidae and Glyphocrangonidae, instead of Alpheidae, i. e., the systematic position of the Hippolytidae is still doubtful; the valid of the families Bythocarididae, Lysmatidae, Merguidae and Thoridae was supported by the analysis; the remaining genera of the Hippolytidae (*sensu lato*) remain in the Hippolytidae Bate, 1888 (*sensu strict*).

When we checked the caridean collections in the Marine Biological Museum, Chinese Academy of Sciences (MBMCAS) in the Institute of Oceanology, Chinese Academy of Sciences (IOCAS), Qingdao, since 2000, a lot of specimens of the family Hippolytidae collected from China seas were separated out. We report the taxonomic research results of the specimens herewith. In this paper, we use the classification of De Grave *et al.* (2014) cautiously, instead of Holthuis (1993) or Christoffersen (1987, 1990).

2 Materials and methods

All the materials examined in this study are deposited in the MBMCAS, including the types. Most of them were fixed with 10% formalin and then preserved within 75% ethanol, the others collected recently were fixed and preserved with 75% ethanol.

The specimens were checked with binocular microscope (NIKON SMZ1500).

The following abbreviations are used in the text:

BT, beam trawl;

cl, carapace length, the length from the level of post margin of orbital to the level of median posterior margin of carapace;

coll., collector (s);

MBM, the MBMCAS in the IOCAS in Qingdao;

no., collection number;

ovig., ovigerous;

st., station.

Bohai Gulf is sometimes written as “Bohai Sea”, it indicates the gulf in the northwest part of the Yellow Sea. The collection time in the “Material examined” are listed as yyyy-mm-dd.

3 Taxonomy

3.1 Checklist of Hippolytidae (*sensu lato*) from China seas

Hippolytidae Bate, 1888 (*sensu lato*)

Hippolytidae Bate, 1888 (*sensu strict*)

Hippolyte Leach, 1814

Hippolyte ventricosa H. Milne Edwards, 1837

Latreutes Stimpson, 1860

Latreutes anoplonyx Kemp, 1914

Latreutes laminirostris Ortmann, 1890

Latreutes planirostris (De Haan, 1844)

Latreutes sp.

Saron Thallwitz, 1891

Saron marmoratus (Olivier, 1811)

Saron neglectus De Man, 1902

Thinora Bruce, 1998

Thinora leptochelus **sp. nov.**

Thinora maldivensis Borradaile, 1915

Tozeuma Stimpson, 1860

Tozeuma lanceolatum Stimpson, 1860

Tozeuma tomentosum (Baker, 1904)

Lysmatidae Dana, 1852

Exhippolysmata Stebbing, 1915

Exhippolysmata ensirostris ensirostris (Kemp, 1914)

Lysmata Risso, 1816

Lysmata ternatensis De Man, 1902

Lysmata vittata (Stimpson, 1860)

Lysmatella Borradaile, 1915

Lysmatella prima Borradaile, 1915

Thoridae Kingsley, 1879 (*sensu* De Grave *et al.*, 2014)

Birulia Bražnikov, 1903

Birulia kishinouyei (Yokoya, 1930)

Eualus Thallwitz, 1892

Eualus gracilirostris (Stimpson, 1860)

Eualus heterodactylus Xu & Li, 2014

Eualus kikuchii Miyake & Hayashi, 1967*

Eualus leptognathus (Stimpson, 1860)

Eualus spathulirostris (Yokoya, 1933)

Heptacarpus Holmes, 1900

Heptacarpus acuticarinatus Komai & Ivanov, 2008

Heptacarpus commensalis Hayashi, 1979*

Heptacarpus futilirostris (Bate, 1888)

Heptacarpus geniculatus (Stimpson, 1860)

Heptacarpus pandaloides (Stimpson, 1860)

Heptacarpus rectirostris (Stimpson, 1860)

Spirontocaris Bate, 1888

Spirontocaris pectinifera (Stimpson, 1860)

Thor Kingsley, 1878

Thor amboinensis (De Man, 1888)

Thor hainanensis Xu & Li, 2014

Thor singularis **sp. nov.**

* Newly recorded species from the China seas.

3.2 Systematics

Crustacea

Decapoda

Caridea

Alpheoidea

Hippolytidae Bate, 1888 (*sensu lato*)

To date, three families of Hippolytidae (*sensu lato*) have been found from China seas. They can be distinguished by the following key.

Key to families of Hippolytidae (*sensu lato*) from China seas.

1. Second pereopod usually with more than 10 carpal articles; dorsal flagellum of antennule biramous in adult, shorter ramus consisting of at least one free article; infraorbital angle of carapace depressed and inconspicuous in adults, lying below antennal tooth **Lysmatidae Dana, 1852**
- Second pereopod with no more than 10 carpal articles; if with more than 10 carpal article, rostrum unarmed dorsally and ventrally 2

2. Second pereopod usually with 6–7 carpal articles; dorsal flagellum of antennule short and very stout in adult, with proximal articles annulated and bearing many closely spaced olfactory hairs, forming brush-like appearance; second segment of antennular peduncle with sharp curved lateral tooth in adult; third segment of antennular peduncle with sharp dorsodistal tooth in adult **Thoridae Kingsley, 1879**
 Second pereopod usually with 2–3 carpal articles; dorsal flagellum not brush-like appearance; second and third segments of antennular peduncle without sharp tooth in adult **Hippolytidae Bate, 1888 (*sensu stricto*)**

3.2.1 Hippolytidae Bate, 1888 (*sensu stricto*)

Hippolytidae Bate, 1888: 480, 503, 574, 576. Type genus: *Hippolyte* Leach, 1814.

Hippolytidae De Grave *et al.*, 2014: 504. (*sensu stricto*; including genera: remaining genera of Hippolytidae Bate, 1888 *sensu lato*, those not included in the Barbouriidae Christoffersen, 1987, Bythocarididae Christoffersen, 1987, Lysmatidae Dana, 1852, Merguiidae Christoffersen, 1990, Thoridae Kingsley, 1879)

To date, five genera of the family Hippolytidae (*sensu stricto*) have been found from China seas. They can be distinguished by the following key.

Key to genera of Hippolytidae (*sensu stricto*) from China seas.

1. Third segment of antennular peduncle with subtriangular dorsal scale; reduced rostrum with single dorsal tooth, adult males usually with marked sexual dimorphism of first pereopods, appendix masculine completely absent ***Thinora* Bruce, 1998**
 Third segment of antennular peduncle without subtriangular dorsal scale; carapace with antennal tooth 2
2. Third maxilliped without exopod; second pereopod with 3 carpal articles ***Tozeuma* Stimpson, 1860**
 Third maxilliped with exopod 3
3. Carapace with single supraorbital tooth ***Hippolyte* Leach, 1814**
 Carapace without supraorbital tooth 4
4. Sixth abdominal somite with movable plate articulated near posteroventral angle ***Saron* Thallwitz, 1891**
 Sixth abdominal somite without movable plate articulated near posteroventral angle; carapace with branchiostegal margin denticulate ***Latreutes* Stimpson, 1860**

3.2.1.1 *Hippolyte* Leach, 1814

Hippolyte Leach, 1814: 431. Type species: *Hippolyte varians* Leach, 1814.

Gender. Feminine.

Diagnosis. Carapace with supraorbital spine; mandible with incisor process but without palp; third maxilliped with exopod; pereopods without arthrobranch; second pereopod with 3-segmented carpus; telson with 2 pairs of dorsal spines.

Distribution. Coastal area in temperate and tropical regions; 0–300 m.

Remarks. To date, only one species of the *Hippolyte* has been recorded from the Chinese waters.

Hippolyte ventricosa H. Milne Edwards, 1837 (Figs 1, 36A–C)

Hippolyte ventricosus H. Milne Edwards, 1837: 371. Type locality: Seas of Asia.

Hippolyte acuta Rathbun, 1906: 912, fig. 3; Edmondson 1946: 252, fig. 153c.

Hippolyte ventricosa Holthuis, 1947: 16, 55, figs. 7–9; Hayashi, 1982: 192, fig. 6; Chace, 1997: 66.

Material examined. MBM136614, 2 ♂ (cl 2.27, 3.14 mm), 10 ovig. ♀ (cl 2.78–3.57 mm), 1987-3-12, no. F11-7-29; MBM136591, 1 ♂ (cl 2.43 mm), Dadonghai, Sanya, Hainan, 1997-3-1, no. CJ97C-82, coll. Xin-Zheng Li; MBM136520, 1 ♂ (cl 2.19 mm), Hainan, Sanya, Xiaodonghai, 1997-3-5, no. CJ97C-239, coll. Xin-Zheng Li; MBM129572, 3 ♂ (cl 2.75–3.29 mm), Guangdong, Nanao, Yunao, 1957-4-30, no. 57K-065; MBM129575, 23 ♂ (cl 1.83–2.67 mm), 16 ovig. ♀ (cl 2.67–3.93 mm), Hainan, Sanya, Xiaodonghai, 1992-3-18, no. 92C-039; MBM129576, 1 ovig. ♀ (cl 2.49 mm), Dadonghai, Sanya, Hainan, 1985-4-21, no. 75-K125; MBM129625, 1 ovig. ♀ (cl 2.32 mm), Hainan, Sanya, Xizhou Island, 1955-12-30, no. 55-K557, coll. Rui-Yu Liu; MBM136608, 5 ♂ (cl 1.61–2.37 mm), 4 ovig. ♀ (cl 1.81–2.56 mm), Dadonghai, Sanya, Hainan, 1997-3-1, no. CJ97C-266, coll. Xin-Zheng Li; MBM129656, 2 ♂ (cl 1.62, 1.76 mm), 1 ♀ (cl 1.72 mm), 9 ovig. ♀ (cl 2.25–3.16 mm), Hainan, Sanya, 1955-4-5, no. 55-K235, coll. Yong-Liang Wang.

Description. Rostrum nearly straight and slightly longer than carapace, with 0–1 tooth on middle of dorsal margin and 3–5 teeth along ventral margin. Carapace smooth, with some tufts of short plumose setae. Supraorbital spine, antennal spine and branchiostegal spine present; pterygostomial angle rounded.

Abdomen smooth and strongly geniculated at third somite. Some tufts of plumosetae present on second to fourth somites. Pleurae of all somites rounded. Lateral plate of sixth somite acutely pointed. Telson slightly shorter than uropod, dorsal surface with 2 pairs of dorsal spines situated equidistantly; posterior margin with 4 pairs of spines.

Eye cylindrical; cornea shorter than stalk. Antennular peduncle falling short of rostral apex; first segment long, with stout outer distal spine; stylocerite long, not reaching distal margin of first segment of antennular peduncle. Antennal scale

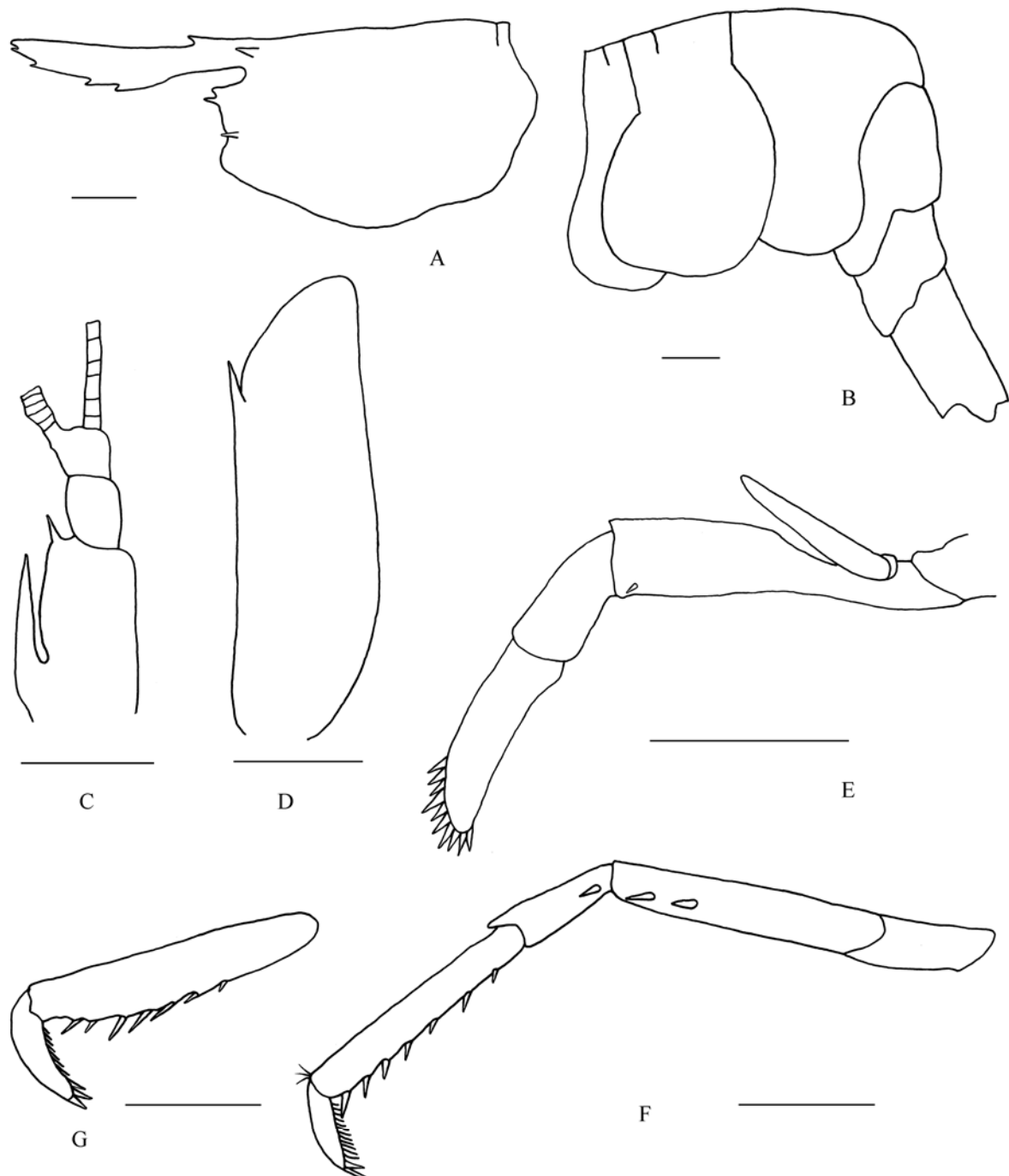


Fig. 1. *Hippolyte ventricosa* H. Milne Edwards, 1837. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennular peduncle, dorsal view; D. Antennal scale; dorsal view; E. Third maxilliped, lateral view; F. Third pereopod in female, lateral view; G. Dactylus and propodus of third pereopod in male, lateral view. Scale bars = 1 mm.

reaching apex of rostrum; about 3 times as long as wide; with distolateral tooth exceeded by lamina.

Third maxilliped reaching distal margin of antennular peduncle, with exopod; ultimate segment flattened, with 10–12 corneous spines distally. First pereopod short, falling short of distal margin of antennular peduncle; chela oval in outline; merus slightly longer than carpus. Second pereopod reaching or slightly overreaching distal margin of antennular peduncle; carpus divided into 3 articles; Ischium slightly shorter than merus. In female, third pereopod long, overreaching antennal scale by dactylus which with 13–16 spinules arranged in parallel on flexor margin; propodus about 2.5 times as long as dactylus, with 12–18 spinules on flexor margin; carpus with single lateral spine on proximal part; merus longer than propodus, with 2 or 3 lateral spines. Fourth pereopod reaching nearly to rostral apex, carpus with single lateral spine on proximal part; merus always with only one lateral spine. Fifth pereopod reaching distal end of antennular peduncle; carpus also with single lateral spine on proximal part; merus with 0 or 1 lateral spine. In male, third to fifth pereopod prehensile and subchelate in different levels; third pereopod being most obvious.

Coloration in life. Body brown or light green.

Distribution. South China Sea; widespread in Indo-Pacific, from Red Sea to South Africa to Japan, Philippines, Indonesia, and Australia, eastward to Hawaii; littoral and slightly sublittoral; 0–25 m.

3.2.1.2 *Latreutes* Stimpson, 1860

Cyclorhynchus De Haan, 1849: 173–175. (invalid junior homonym of *Cyclorhynchus* Kaup, 1829 (Aves), *Cyclorhynchus* Sundevall, 1836 (Aves), and *Cyclorhynchus* Macquim, 1841 (Diptera)). Type species: *Hippolyte ensiferus* H. Milne Edwards, 1837.

Latreutes Stimpson, 1860: 27.

Gender. Masculine.

Diagnosis. Carapace with branchiostegal margin denticulate; without supraorbital spine but with a small tooth on gastric region; rostrum with ventral blade conspicuously developed and projecting posteroventrally between bases of antennules; mandible only with molar process; pereopods without arthrobranch; third maxilliped with exopod; second pereopod with 3-segmented carpus.

Distribution. China seas; Red Sea and South Africa to Kurile Islands and Philippines, Indonesia, Australia, Chile, and Western and Eastern Atlantic; 0–110 m.

Remarks. To date, five species of this genus were recorded from China seas (in the lists of Huang, 1994; Liu, 2008). However, we have never found the specimens of *Latreutes anoplonyx* Kemp, 1914 and *L. pygmaeus* Nobili, 1904 in the collections of China. Only three species of the *Latreutes* have been certainly recorded from the Chinese waters. They can be distinguished by the following key. When we finished the preparation of this paper, one female specimen of this genus which seems very close to *L. pymoeus* Nobili, 1904, was collected from sandy intertidal zone of Dongfang, Hainan Island. Here we treat this species as *Latreutes* sp. (Fig. 36D), will report it late.

Key to species of the genus *Latreutes* from China seas.

1. Rostrum triangular with distal end acute.....2
Rostrum rectangular with distal end broad.....*L. laminirostris* Ortmann, 1890
2. Carapace being smooth on median part posterior to small tooth on gastric region *L. anoplonyx* Kemp, 1914
Carapace with conspicuous verruca on median part posterior to big tooth on gastric region.....
.....*L. planirostris* (De Haan, 1844)

Latreutes anoplonyx Kemp, 1914 (Fig. 2)

Latreutes anoplonyx Kemp, 1914: 104, figs. 3–5; Hayashi & Miyake, 1968: 14, figs. 2, 4b; Chace, 1997: 69. Type locality: Bombay, India.

Material examined. MBM129988, 1 ♂ (cl 3.12 mm), 1 ovig. ♀ (cl 3.59 mm), 1957-8-19, st. P802, 20.5 m, mud, BT, no. VV7B-25, coll. Zhi-Can Tang; MBM129991, 1 ♀ (cl 3.33 mm), Shandong, Qingdao, Cangkou, 1956-11-20, no.56-921, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM129992, 1 ovig. ♀ (cl 4.01 mm), Shandong, Qingdao, Shilaoren, 1956-5-9, no.56-0461, coll. Zhen-Gang Fan; MBM129994, 3 ♂ (cl 1.78–3.26 mm), 2 ovig. ♀ (cl 2.70, 3.53 mm), Shandong, Qingdao, Dagong Island, 1958-8-22, no.0006-35; MBM129995, 3 ♂ (cl 1.63–2.85 mm), 1 ♀ (cl 4.36 mm), 1957-7-16, st. P110, 29 m, sandy mud, BT, no. VII27B-12, coll. Rui-Yu Liu; MBM129996, 13 ♂ (cl 3.57–6.05 mm), 5 ♀ (cl 7.49–8.13 mm), Shandong, Qingdao, Shazikou, 1957-4-3, no.57-257; MBM129997, 4 ovig. ♀ (cl 5.78–7.39 mm), Shandong, Qingdao,

Shazikou, 1956-10-6, no.56-1050, coll. Jie-Shan Xu; MBM129998, 5 ♂ (cl 5.23–5.86 mm), 4 ♀ (cl 4.53–6.75 mm), 1 ovig. ♀ (cl 6.11 mm), Yellow Sea, 1957-11-15, st. Y502, 44 m, mud, BT, no. VXI18B-5, coll. Zhi-Can Tang; MBM129999, 1 ♂ (cl 3.86 mm), 1957-9-23, st. P404, 28 m, mud, BT, no. VXVIII2B-11, coll. Rui-Yu Liu; MBM136353, 1 ♀ (cl 4.02 mm), 1 ovig. ♀ (cl 4.43 mm), East China Sea, 1976-6-26, st. II-2, 55 m, muddy sand, AT, no. V478B-15, coll. Zhi-Can Tang; MBM136333, 3 ♂ (cl 6.53–7.19 mm), 2 ♀ (cl 5.64, 6.32 mm), Shandong, Qingdao, Shazikou, 1955-3-26, no.55-01077; MBM136373, 8 ♂ (cl 4.59–5.56 mm), 6 ovig. ♀ (cl 4.31–7.82 mm), Shandong, Qingdao, Houhai, 1955-9-3, no.055-1202; MBM136370, 10 ♂ (cl 4.13–5.46 mm), 5 ♀ (cl 4.63–5.51 mm), Yellow Sea, 1957-11-16, st. Y701, 14 m, Silty sand and mud, BT, no. VXI29B-6, coll. Zhi-Can Tang; MBM136371, 15 ♂ (cl 3.93–6.40 mm), 13 ♀ (cl 5.33–6.67 mm), Shandong, Qingdao, Shilaoren, 1952-3-13; MBM136362, 10 ♂ (cl 4.37–5.21 mm), 18 ovig. ♀ (cl 5.19–6.82 mm), 1957-8-24, st. 1957-8-24, P503, 30 m, BT, no. VV12B-21, coll. Zhi-Can Tang.

Material examined. MBM129988, 1 ♂ (cl 3.12 mm), 1 ovig. ♀ (cl 3.59 mm), 1957-8-19, st. P802, 20.5 m, mud, BT, no. VV7B-25, coll. Zhi-Can Tang; MBM129991, 1 ♀ (cl 3.33 mm), Shandong, Qingdao, Cangkou, 1956-11-20, no.56-921,

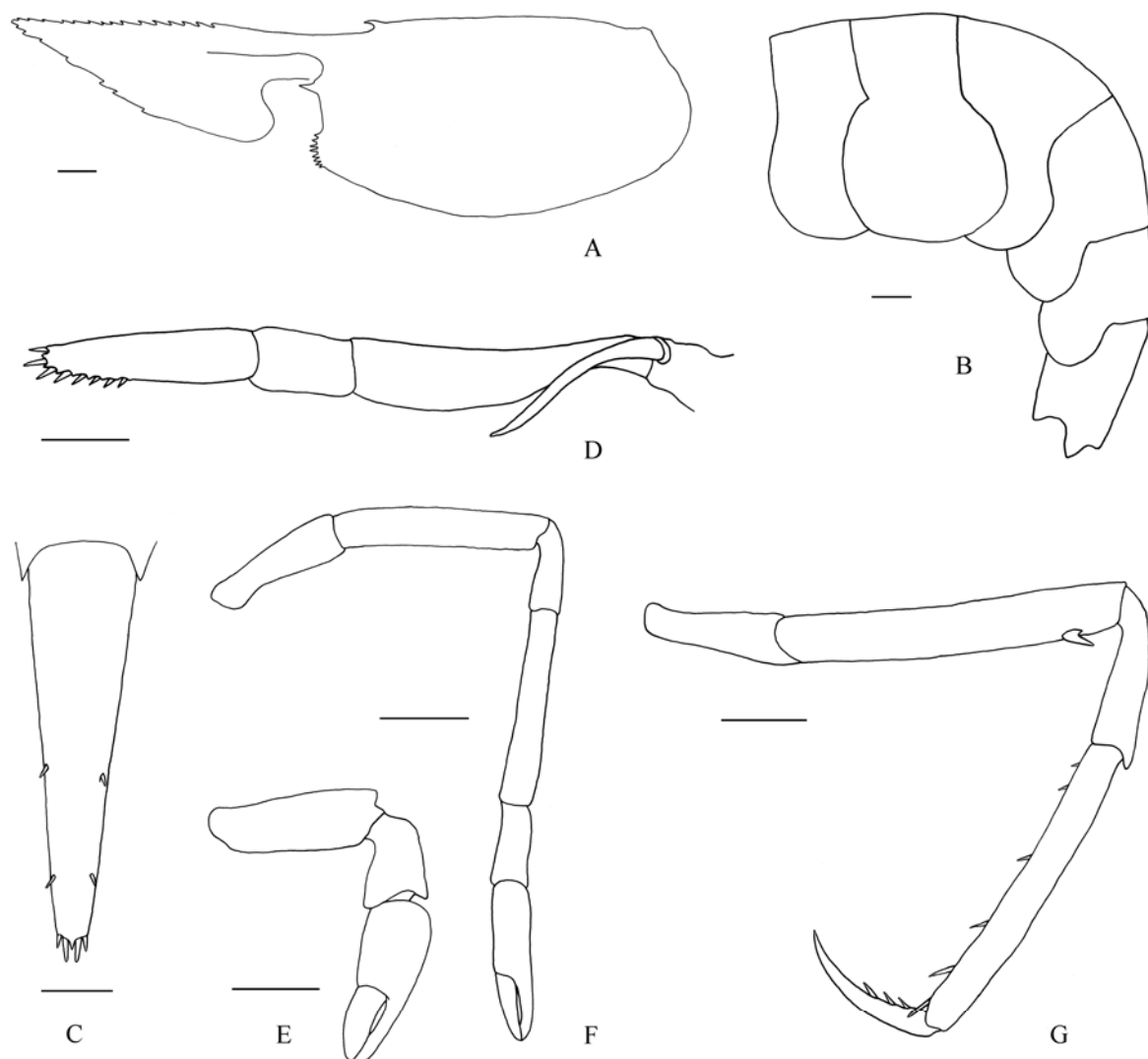


Fig. 2. *Latreutes anoplonyx* Kemp, 1914. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Telson, dorsal view; D. Third maxilliped, lateral view; E. First pereopod, lateral view; F. Second pereopod, lateral view; G. Third maxilliped, lateral view. Scale bars = 1 mm.

coll. Zhen-Gang Fan & Jie-Shan Xu; MBM129992, 1 ovig. ♀ (cl 4.01 mm), Shandong, Qingdao, Shilaoren, 1956-5-9, no.56-0461, coll. Zhen-Gang Fan; MBM129994, 3 ♂ (cl 1.78–3.26 mm), 2 ovig. ♀ (cl 2.70, 3.53 mm), Shandong, Qingdao, Dagong Island, 1958-8-22, no.0006-35; MBM129995, 3 ♂ (cl 1.63–2.85 mm), 1 ♀ (cl 4.36 mm), 1957-7-16, st. P110, 29 m, sandy mud, BT, no. VII27B-12, coll. Rui-Yu Liu; MBM129996, 13 ♂ (cl 3.57–6.05 mm), 5 ♀ (cl 7.49–8.13 mm), Shandong, Qingdao, Shazikou, 1957-4-3, no.57-257; MBM129997, 4 ovig. ♀ (cl 5.78–7.39 mm), Shandong, Qingdao, Shazikou, 1956-10-6, no.56-1050, coll. Jie-Shan Xu; MBM129998, 5 ♂ (cl 5.23–5.86 mm), 4 ♀ (cl 4.53–6.75 mm), 1 ovig. ♀ (cl 6.11 mm), Yellow Sea, 1957-11-15, st. Y502, 44 m, mud, BT, no. VXI18B-5, coll. Zhi-Can Tang; MBM129999, 1 ♂ (cl 3.86 mm), 1957-9-23, st. P404, 28 m, mud, BT, no. VXXVIII2B-11, coll. Rui-Yu Liu; MBM136353, 1 ♀ (cl 4.02 mm), 1 ovig. ♀ (cl 4.43 mm), East China Sea, 1976-6-26, st. II-2, 55 m, muddy sand, AT, no. V478B-15, coll. Zhi-Can Tang; MBM136333, 3 ♂ (cl 6.53–7.19 mm), 2 ♀ (cl 5.64, 6.32 mm), Shandong, Qingdao, Shazikou, 1955-3-26, no.55-01077; MBM136373, 8 ♂ (cl 4.59–5.56 mm), 6 ovig. ♀ (cl 4.31–7.82 mm), Shandong, Qingdao, Houhai, 1955-9-3, no.055-1202; MBM136370, 10 ♂ (cl 4.13–5.46 mm), 5 ♀ (cl 4.63–5.51 mm), Yellow Sea, 1957-11-16, st. Y701, 14 m, Silty sand and mud, BT, no. VXI29B-6, coll. Zhi-Can Tang; MBM136371, 15 ♂ (cl 3.93–6.40 mm), 13 ♀ (cl 5.33–6.67 mm), Shandong, Qingdao, Shilaoren, 1952-3-13; MBM136362, 10 ♂ (cl 4.37–5.21 mm), 18 ovig. ♀ (cl 5.19–6.82 mm), 1957-8-24, st. P503, 30 m, BT, no. VV12B-21, coll. Zhi-Can Tang.

Description. Rostrum with ventral blade conspicuously developed, present triangular in lateral view, apically sharp; much narrower and longer in male than in female; number of tiny teeth of rostrum greatly changed; dorsal margin with normally 7–22 teeth, ventral margin with 6–11 teeth. Carapace bearing small tooth on gastric region, being smooth on postrostral and posterior medianpart; antennal spine present and branchiostegal margin denticulate with 8–13 spinules. Abdomen smooth, six somite 0.6–0.8 times as long as telson; telson with 2 pairs of dorsal spines; acute posterior margin with 2 pairs of spines.

Eye short, reaching distal end of first segment of antennular peduncle. Antennular peduncle short, about 1/3 times as long as carapace; only first segment with small marginal spine; stylocerite wide and rounded. Antennal scale being 4 times as long as wide; ending in sharp point. Third maxilliped overreaching midpoint of antennal scale, with an exopod, ultimate segment with 8 or 9 corneous spines distally.

First 4 pairs of pereopods with epipods. First pereopod reaching distal end of first segment of antennular peduncle, dactylus shorter than palm. Second pereopod slender, reaching beyond midpoint of antennal scale by chela; dactylus slightly shorter than palm; carpus divided into 3 articles, of which middle one longest, longer than combination of rest two articles. Third pereopod longest, reaching distal margin of antennal scale; propodus 3 times as long as dactylus, which flexor margin with 3–5 spinules; flexor margin of propodus with 5 or 6 spinules; merus with one spine on distolateral margin. Fourth and fifth pereopods in similar structure with third one. Uropods as long as telson, outer branch of uropod with movable spine along suture.

Coloration in life. Body in red brown with black and white spots.

Distribution. From Bohai Gulfto northern South China Sea; India, Burma, Japan, Philippines, Indonesia; often associated with medusae.

Latreutes laminirostris Ortmann, 1890 (Fig. 3)

Latreutes laminirostris Ortmann, 1890: 506, pls. 36. Type locality: Mutsu Bay, Japan.

Material examined. MBM129806, 23 ♂ (cl 4.69–5.52 mm), Shandong, Yantai, Gangbei; MBM129807, 1 ♂ (cl 7.81 mm), 1 ♀ (cl 8.67 mm), 5 ovig. ♀ (cl 9.01–10.34 mm), Shandong, Qingdao, Huang Island, 1983-6-24; MBM129808, 4 ♂ (cl 4.58–7.02 mm), 3 ovig. ♀ (cl 6.74–7.91 mm), Shandong, Qingdao, Xuejia Island, 1951-6-30; MBM129809, 17 ♂ (cl 5.37–6.86 mm), 5 ♀ (cl 6.67–7.02 mm), 13 ovig. ♀ (cl 6.19–7.72 mm), Shandong, Yantai, Beigang, 1983-6-1; MBM129810, 3 ♂ (cl 4.13–6.85 mm), 2 ovig. ♀ (cl 7.75, 7.91 mm), Shandong, Qingdao, Xuejia Island, 1951-6-30; MBM129811, 1 ♂ (cl 5.06 mm), Shandong, Qingdao, Xuejia Island, 1951-10-25; MBM129812, 5 ♂ (cl 6.28–6.85 mm), 2 ovig. ♀ (cl 6.78, 7.06 mm), Shandong, Yantai, Zhifu Island, 1954-7-25, no.4-090; MBM129814, 1 ♂ (cl 5.87 mm), 3 ovig. ♀ (cl 7.62–8.53 mm), 1951-7-28, no.2213; MBM129815, 1 ♂ (cl 4.31 mm); MBM129818, 13 ovig. ♀ (cl 6.31–8.92 mm), Shandong, Qingdao, Xuejia Island, 1951-7-30, no.2253.

Description. Body slender. Rostrum with ventral blade conspicuously developed, present rectangular with distal end broad, 3–4 times as long as wide in lateral view and 1.5 times as long as carapace; distal 1/3 overreaching distal margin of antennal scale; dorsal and ventral margin straight; upper corner of distal margin with apex convex; dorsal margin with

6–11 teeth, distal 2 of which near apex; ventral margin with 6–10 teeth. Carapace bearing small tooth on gastric region, being smooth on postrostral and posterior medianpart; antennal spine present and branchiostegal margin denticulate with 6–10 spinules.

Abdomen slender and smooth. Telson about 1.5 times as long as sixth somite, with posterior margin pointed. Third maxilliped reaching distal margin of first segment of antennular peduncle; ultimate segment with 9 or 10 corneous spines distally. First 4 pairs of pereopods with epipods.

First pereopod stout, slightly overreaching posterior margin of orbit; dactylus slightly longer than palm; chela about 2.6 times as long as carpus; merus as long as chela. Second pereopod reaching distal end of antennular peduncle; carpus subdivided into 3 articles, of which middle one longest, equal to combination of rest two articles. Third pereopod reaching midpoint of antennal scale; flexor margin of propodus with 2 rows of spinules; biunguiculate dactylus slender, flexor margin with 7 spinules. Fourth and fifth pereopods similar to third pereopod; merus of last 3 pereopods each with distolateral spine. Uropods as long as telson, outerbranch of uropod with movable spine along suture.

Coloration in life. Green or brown, always with brown or white longitudinal stripes on back; color often changes with surrounding environment.

Distribution. Northern China seas; Red Sea and east coast of Africa, Sabah Island of Malaysia, South Korea, Japan, Indonesia, and Northern Australian waters; 5–60 m.



Fig. 3. *Latreutes laminirostris* Ortmann, 1890. Carapace, lateral view. Scale bar = 1 mm.

***Latreutes planirostris* (De Haan, 1844) (Fig. 4)**

Cyclorhynchus planirostris de Haan, 1844: 175, tab. 45, fig. 7. Type locality: Japanese coast.

Rhynchocycilus planirostris Miers, 1879: 55.

Latreutes planirostris Ortmann, 1890: 505, Tab. 37, figs. 4.

Material examined. MBM129833, 3 ♂ (cl 1.32–1.95 mm), 1 ♀ (cl 1.97 mm), Shandong, Qingdao, Shazikou, 1957-7-17, no.57-517, coll. En-Ze Yang; MBM129834, 11 ♂ (cl 2.16–3.73 mm), 17 ovig. ♀ (cl 2.78–4.39 mm), Shandong, Qingdao, 1957-5-18, coll. Feng-Xuan Zhang; MBM129835, 1 ovig. ♀ (cl 5.07 mm), Yellow Sea, 1992-9-10, st.3305, 48 m, muddy sand, AT, no. B-21, coll. Feng-Shan Xu; MBM129836, 1 ♂ (cl 3.16 mm), Shandong, Qingdao, Hongshiya, 1981-3-7, National Ocean Survey, coll. Xian-Qiu Ren; MBM057775, 1 ♂ (cl 2.53 mm), Northern part of Yellow Sea, 1958-10-13, st.2048, 50 m, hard clay, no.13-18, coll. Yu-Heng Cui; MBM057633, 1 ♀ (cl 2.76 mm), Bohai Gulf, 1959-7-20, st.1031, 22.6 m, brown mud, AT, no. H243B-9, coll. Mu Chen; MBM057634, 1 ♂ (cl 3.39 mm), Bohai Gulf, 1959-7-27, st.1008, 18.7 m, muddy sand and gravel, AT, no. H326B-7; MBM129837, 1 ♀ (cl 2.78 mm), Yellow Sea, 1959-10-24, st.4031, 25 m, brown sand and gravel, AT, no. V311B-34; MBM057637, 1 ♀ (cl 4.16 mm), Bohai Gulf, 1959-10-31, st.1017, 18 m, sand, AT, no. H335B-12; MBM129838, 1 ♂ (cl 4.43 mm), 1958-4-8, st. P102 11.8 m, mud, BT, no. VXIV57B-11; MBM129839, 1 ♂ (cl 2.23 mm), 1 ovig. ♀ (cl 3.87 mm), Shandong, Qingdao, Shazikou, 1965-5-4, coll. Xiu-Bin Fang; MBM129840, 7 ♂ (cl 2.73–3.91 mm), 4 ♀ (cl 3.26–4.32 mm), Shandong, Qingdao, Shilaoren, 1956-7-10, no.56-613, coll. Jie-Shan Xu; MBM129841, 1 ovig. ♀ (cl 4.16 mm), Shandong, Qingdao, Jiaozhou Bay, 1964-8-2, st. K018, 35.8 m, gravel, mud and sand, AT, no. M118B-5; MBM129842, 3 ♂ (cl 2.24–2.79 mm), Shandong, Qingdao, Shazikou, 1993-3-23, no. S93C-8, coll. Yong-Liang Wang; MBM129843, 1 ovig. ♀ (cl 4.03 mm), Shandong, Qingdao, Jiaozhou Bay, 1964-8-14, st. K038, 32 m, sand and mud, AT, no. M138B-4; MBM129845, 17 ♂ (cl 2.09–2.76 mm), 1 ovig. ♀ (cl 3.70 mm), coll. Rui-Yu Liu; MBM129846, 5 ♂ (cl 1.46–2.67 mm), 1957-8-8, st. P704, 20 m, no. VIV20B-5, coll. Rui-Yu Liu; MBM129847, 1 ♂ (cl 2.63 mm), Yellow Sea, 1957-11-16, st. Y704, 50.5 m, shell and stone, BT, no. VXI26B-25, coll. Rui-Yu Liu; MBM129849, 1 ovig. ♀ (cl 3.18 mm), Shandong, Qingdao, Yin Island, 1954-6-9; MBM129853, 1 ♂ (cl 2.57 mm), 1 ovig. ♀ (cl 3.06 mm),

East China Sea, 1976-9-19, st. II-3, 60 m, muddy sand, AT, no. V542B-28, coll. Zhi-Can Tang & Bao-Lin Zhang; MBM129854, 1 ♂ (cl 1.86 mm), 1 ovig. ♀ (cl 2.13 mm), Shandong, Qingdao, Xuejia Island, coll. Zhen-Gang Fan & Xiu-Bin Fang; MBM129855, 1 ovig. ♀ (cl 4.03 mm), 1957-6-18; MBM129856, 1 ovig. ♀ (cl 2.76 mm), Shandong, Qingdao, Jiaozhou Bay, 1964-8-2, st. K09, 45 m, sandy mud and gravel, no. M109B-4; MBM129857, 1 ovig. ♀ (cl 4.87 mm), Yellow Sea, 1992-5-27, st.3401, 19 m, fine sand, AT, no. B-13K, coll. Feng-Shan Xu; MBM129860, 2 ovig. ♀ (cl 4.34, 4.73 mm), Yellow Sea, 1992-6-2, st.3203, 36 m, sand, AT, no. B-7, coll. Feng-Shan Xu; MBM129861, 3 ♂ (cl 1.87–2.63 mm), Shandong, Qingdao, Xiaoqing Island, 1955-10-24, coll. Jie-Shan Xu; MBM129863, 23 ♂ (cl 2.19–4.08 mm), 2 ♀ (cl 4.37, 4.51 mm), market of Xincun, 1951-3-24; MBM129865, 10 ♂ (cl 1.13–2.89 mm), 1 ovig. ♀ (cl 2.63 mm), Shandong, Haiyang, Fengcheng, 1981-6-17, no.81S-2L, coll. Shao-Wu Wang; MBM129866, 7 ♂ (cl 2.26–2.91 mm), 3 ♀ (cl 2.14–3.80 mm), Shandong, Qingdao, Fishing Farm, 1955-11-18, no.55-1275, coll. Feng-Xuan Zhang; MBM129868, 5 ♂ (cl 2.51–3.15 mm), 2 ♀ (cl 3.01, 3.07 mm), Shandong, Longkou, Furong Island, 1956-2-12; MBM129869, 2 ♂ (cl 2.21, 2.34 mm), East China Sea, 1976-9-19, st. II-5, 64 m, muddy sand, AT, no. V540B-49, coll. Zhi-Can Tang & Bao-Lin Zhang; MBM129870, 1 ♀ (cl 3.49 mm), Liaoning, Dalian, Changxing Island, 1952-10-12, no.52-0842; MBM129871, 21 ♂ (cl 2.15–4.16 mm), Shandong, Qingdao, Yin Island, 1955-3-26, no.55-01082; MBM129872, 1 ♂ (cl 1.83 mm), East China Sea, 1975-10-8, st. G-2, 55 m, Fine sand, AT, no. V463B-30, coll. Zhi-Can Tang & Jie-Shan Xu; MBM129875, 4 ♂ (cl 2.04–2.95 mm), 2 ♀ (cl 3.77, 4.13 mm), 1958-10-23, st.1098, 55 m, gravel and shell, BT, no.64-8YP, coll. Zhi-Can Tang; MBM129876, 9 ♂ (cl 2.88–3.76 mm), 6 ♀ (cl 3.53–3.87 mm), 2 ovig. ♀ (cl 3.63, 3.81 mm), Fujian, Xiamen, 1957-3-28, no.57F-253, coll. Hui-Lian Chen; MBM129877, 51 ♂ (cl 2.21–4.35 mm), Shandong, Qingdao, Dagong Island, 1954-3-31, no.54-0259; MBM129879, 1 ♀ (cl 4.23 mm), 1992-5-30, st.3303, mud, AT, no. B-10, coll. Feng-Shan Xu; MBM129880, 5 ♂ (cl 2.79–3.51 mm), 1958-4-2, st. P904, 13.3 m, mud, no. VXIV6B-14; MBM129882, 1 ♂ (cl 3.27 mm), Shandong, Qingdao, Cangkou, 1955-3-11, no.55-01057; MBM129884, 18 ♂ (cl 1.91–2.53 mm), 1 ♀ (cl 3.03 mm); MBM129885, 1 ♂ (cl 3.01 mm), Shandong, Qingdao, Hongshiya, 1981-3-7, coll. Xian-Qiu Ren; MBM129886, 1 ♀ (cl 4.49 mm), Shandong, Rongcheng, Longxu Island, 1951-5-6, no.51-0425; MBM129887, 1 ♂ (cl 3.06 mm), Shandong, Qingdao, Shazikou, 1963-12-3, no.63-S0075, coll. Zhen-Gang Fang, Mu Chen, Jie-Shan Xu & Xiu-Bin Fang; MBM129888, 43 ♂ (cl 2.13–3.94 mm), Shandong, Qingdao, Shazikou, 1957-2-5, no.57-102, coll. Feng-Xuan Zhang & En-Ze Yang; MBM129889, 32 ♂ (cl 2.31–3.59 mm), 9 ♀ (cl 2.76–3.62 mm), Shandong, Qingdao, Zhan Bridge, 1956-11-16, no.56-905; MBM129890, 3 ♂ (cl 2.59–3.65 mm), Shandong, Qingdao, Shazikou, 1957-12-24, no.57-878; MBM129892, 1 ♀ (cl 3.42 mm), Shandong, Yantai, 1953-4-7; MBM129893, 1 ♂ (cl 2.12 mm), Shandong, Qingdao, Hongshiya, 1981-5-7, st.3, no.6.

Description. Rostrum similar to *Latreutes anoplonyx*, present arrow-shape in lateral view; much narrower and longer in male than in female. In female, rostrum slightly shorter than carapace; reaching distal margin of antennal scale; 2.0–2.5 times as long as wide; distal half of dorsal margin descending. In male, rostrum 1.2–1.5 times as long as carapace, overreaching distal margin of antennal scale, 3.0–4.0 times as long as wide; dorsal margin straight. Number of rostral teeth greatly changeable; dorsal margin with 7–15 teeth; ventral margin with 6–11 teeth; most teeth of dorsal and ventral margin locating on distal half of rostrum. Carapace with conspicuous verruca on median part posterior to big tooth on gastric region; antennal spine present and branchiostegal margin denticulate with 8–11 spinules.

Back of second and third somite with longitudinal ridges; sixth somite 0.5–0.7 times as long as telson. Antennular peduncle short, similar to *Latreutes anoplonyx*. Third maxilliped not reaching midpoint of antennal scale; ultimate segment with 8–10 corneous spines distally. First 4 pairs of pereopods with epipods. First and second pereopods similar to *Latreutes anoplonyx*. Second pereopod overreaching midpoint of antennal scale; third pereopod reaching distal margin of



Fig. 4. *Latreutes planirostris* (De Haan, 1844). Carapace, lateral view. Scale bar = 1 mm.

antennal scale. Last 3 pairs of pereopods with biunguiculate dactylus, which flexor margin bearing 4 or 5 spinules; merus each with 1 distolateral spine.

Coloration in life. Body brown, black and white; color often changes with surrounding environment.

Distribution. China seas; Sea of Japan; living in sandy or muddy bottoms of shallow water, like attaching to other objects; 5–110 m.

3.2.1.3 *Saron* Thallwitz, 1891

Saron Thallwitz, 1891: 99. Type species: *Hippolyte gibberosus* H. Milne Edwards, 1837.

Gender. Masculine.

Diagnosis. Carapace without supraorbital tooth; mandible with molar process, incisor process and palp; third maxilliped with exopod, epipod and arthrobranch; first to fourth pereopods with epipods and arthrobranch; carpus of second pereopod subdivided into many articles; sixth abdominal somite with movable plate articulated near posteroventral angle.

Distribution. South China Sea; Red Sea and eastern Africa to Hawaii, Marquesas Islands, and Tuamotu Archipelago; littoral.

Remarks. To date, two species of the *Saron* have been certainly recorded from the China seas. They can be distinguished by the following key.

Key to species of the genus *Saron* from China seas.

1. Orbital margin double; third pereopod with only 1 distolateral spine *S. neglectus* De Man, 1902
- Orbital margin single; third pereopod with 2 distolateral spines *S. marmoratus* (Olivier, 1811)

Saron marmoratus (Olivier, 1811) (Fig. 5)

Palaemon marmoratus Olivier, 1811: 652. Type locality: Australian coast.

Hippolyte gibbosus Dana, 1852a: 565.

Hippolyte hemprichii Heller, 1862: 275.

Hippolyte marmorata De Man, 1888: 533; Ortmann, 1890, 497.

Saron gibberosus Thallwitz, 1891: 100; De Man, 1902: 852; Parisi, 1919: 74.

Spirontocaris gibberosa Balss, 1914: 46.

Saron marmoratus Holthuis, 1947: 25; Barnard, 1950: 688; Miyake & Hayashi, 1966: 143–160; McNeil, 1968: 19; Kensley, 1972: 60; Bruce, 1976: 49; Debelius, 1984: 60; Jones, 1986: 153; Holthuis, 1993: 247–248; Chace, 1997: 89; Poore, 2004: 125.

Material examined. MBM129760, 1 ovig. ♀ (cl 5.67 mm), Hainan, Ledong, Yinggehai, 1955-5-4, coll. Bao-Ling Wu; MBM129764, 1 ♂ (cl 5.47 mm), 1 ovig. ♀ (cl 6.77 mm), Hainan, Sanya, 1958-3-21; MBM129765, 1 ovig. ♀ (cl 5.25 mm); MBM129767, 1 ovig. ♀ (cl 9.20 mm), Hainan, Sanya, Luhuitou, 1992-3-17, coll. Yong-Liang Wang; MBM129769, 2 ♂ (cl 8.60, 8.62 mm), Hainan, Xisha Islands, Jinyin Island, 1980-5-15, coll. Xiu-Bin Fang; MBM136605, 1 ♂ (cl 4.05 mm), Hainan, Sanya, Haitangtou, 1957-7-1; MBM136637, 1 ♂ (cl 9.61 mm), Hainan, Sanya, Luhuitou, 1957-6-30; MBM136496, 4 ♂ (cl 2.47–3.91 mm), 2 ovig. ♀ (cl 4.97, 4.99 mm), Guangdong, Guangzhou, Shu Island, 1958-5-1, coll. Zhen-Gang Fang; MBM136434, 1 ♂ (cl 6.89 mm), Hainan, Sanya, Xizhou Island, 1964-4-27; MBM136477, 1 ovig. ♀ (cl 8.53 mm), Hainan, Sanya, Xiaodonghai, 1992-3-18, coll. Yu-Lin Liao; MBM136645, 2 ♂ (cl 6.62–8.07 mm), Hainan, Sanya, Dengta, 1958-3-25; MBM129770, 1 ♀ (cl 3.54 mm), Hainan, Xisha Islands, Northeast Beach of Jinyin Island, 1975-5-25; MBM129771, 3 ♂ (cl 1.56–3.04 mm), 1 ovig. ♀ (cl 5.16 mm), Hainan, Xisha Islands, Yongxin Island, 1981-5-31, coll. Chen Meng; MBM129772, 1 ♀ (cl 3.63 mm), Hainan, Xisha Islands, Yongxin Island, 1980-5-8; MBM129773, 1 ♂ (cl 6.43 mm), Hainan, Xisha Islands, Jinqing Island, 1958-4-24, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM129774, 1 ♂ (cl 6.01 mm), Dadonghai, Sanya, Hainan, 1997-11-17, coll. Xin-Zheng Li; MBM129775, 3 ♀ (cl 6.20–6.82 mm), Hainan, Sanya, Xiaodonghai, 1997-11-18, coll. Xin-Zheng Li; MBM129776, 1 ovig. ♀ (cl 6.71 mm), Hainan, Lingshui, Xincun, 1992-3-27, coll. Xin-Zheng Li; MBM129777, 1 ♂ (cl 7.16 mm), Hainan, Sanya, Southeast Beach of Sanya Gulf, 1997-12-2, coll. Xin-Zheng Li; MBM129779, 1 ovig. ♀ (cl 5.09 mm), 1 ♀ (cl 2.80 mm), Hainan, Xisha Islands, Shi Island, 1975-5-9, coll. Xian-Qiu Ren; MBM129780, 2 ♂ (cl 4.87, 7.88 mm), Hainan, Xisha Islands, Shi Island, 1981-6-2, coll. Chen Meng; MBM129781, 1 ♂ (cl 9.21 mm), Dadonghai, Sanya, Hainan, 1997-3-7, coll. Xin-Zheng Li; MBM129782, 1 ♀ (cl 7.83 mm), Hainan, Sanya, Xizhou Island, 1955-12-30, coll. Rui-Yu Liu; MBM129783, 1 ♂ (cl 2.16 mm), Hainan, Xisha Islands, Shi Island, 1980-5-10, coll. Xiu-Bin Fang; MBM129784, 6 ♂ (cl

2.36–5.11 mm), Hainan, Xisha Islands, Jinqing Island, 1980-5-19; MBM129785, 1 ♀ (cl 5.68 mm), Dadonghai, Sanya, Hainan, 1997-11-20, coll. Xin-Zheng Li; MBM129786, 1 ovig. ♀ (cl 6.71 mm), 1 ♀ (cl 5.50 mm), Hainan, Xisha Islands, Chenhang Island, 1981-5-21.

Description. Rostrum longer than carapace; dorsal margin of rostrum with 7 teeth, proximal 3 of which stand upon carapace; ventral margin with 5–8 (mostly 6) teeth. Carapace with well-developed antennal tooth, moderate branchiostegal tooth and feeble pterygostomial tooth. Several tufts of long and dense plumose hairs studded with one row on dorsal carina of carapace and two rows along dorsal medial line of abdomen. Orbital margin single; eye big with distinct ocellar spot; cornea shorter than stalk. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth; sixth abdominal somite with movable plate articulated near posteroventral angle. Telson with 2 pairs of dorsal spines; posterior margin bearing 3 big spines and 2 small spines.

Basal segment of antennular peduncle longer than combination of second and third segment; dorsal margin of third segment with sharp triangular spine, which apex reaching midpoint of antennal scale; stylocerite reaching distal margin of third segment of antennular peduncle. Distolateral spine of antennal scale exceeding rounded distal margin of blade. Third maxilliped reaching distal margin of antennal scale; distal end of antepenultimate segment with 2 well-developed protrusions; exopod developed; ultimate segment with 6–8 corneous spines distally. First to fourth pereopods with epipods and arthrobranch.



Fig. 5. *Saron marmoratus* (Olivier, 1811). Carapace lateral view. Scale bar = 1 mm.

Adult males showing well-represented secondary sexual character with first pereopod; which so much developed and reaching distal margin of antennal scale; females with first pereopod normally, reaching midpoint of antennal scale; chela about 1.5 times as long as carpus.

Second pereopod reaching distal margin of antennal scale; carpus subdivided into 9–13 articles. Third to fifth pereopods with similar structure. Merus of third or fourth pereopod each with 2 distolateral spines; merus of fifth pereopod with only 1 or 2 distolateral spines; flexor margin of biunguiculate dactylus armed with 3–4 accessory spinules, propodus with row of 8–10 spinules along entire length of flexor margin. Second pleopod in male with appendix masculine moderately stout, about half length of appendix interna.

Coloration in life. Whole body with dark gray spots; antennal scale, third maxilliped and all pereopods with black stripes.

Distribution. South China Sea; from Red Sea to Hawaii Islands, widespread across tropical regions of whole India-West Pacific; coral reefs.

***Saron neglectus* De Man, 1902 (Fig. 6)**

Saron neglectus De Man, 1902: 854, pl. 26, fig. 58; Kemp, 1914: 87; Holthuis, 1947: 30; Miyake & Hayashi, 1966: 146, figs. 2, 3d–f; Chace, 1997: 90. Type locality: Ternate, Indonesia.

Material examined. MBM136467, 1 ♂ (cl 5.67 mm), 1 ♀ (cl 4.91 mm), South China Sea, Hainan, Wufangjiao, 1990-5-6, 1–4 m, coral reef, no. SSFJ8-55.

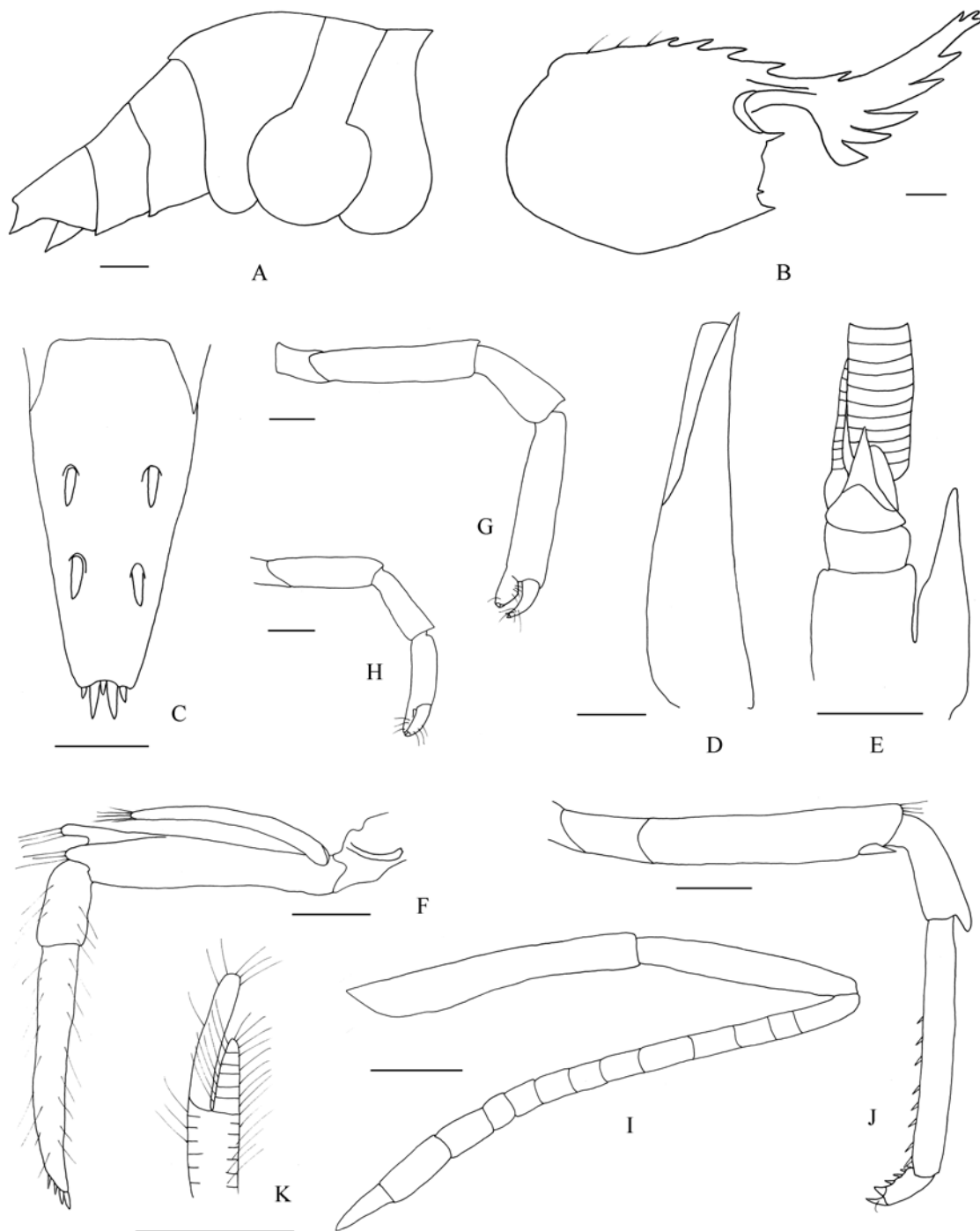


Fig. 6. *Saron neglectus* De Man, 1902. A. Abdominal pleurae, lateral view; B. Carapace, lateral view; C. Telson, dorsal view; D. Antennal scale, dorsal view; E. Antennular peduncle, dorsal view; F. Third pereopod, lateral view; G. First pereopod in male, lateral view; H. First pereopod in female, lateral view; I. Second pereopod, lateral view; J. Third pereopod, lateral view; K. Endopod of second pleopod in male (distal part portion), lateral view. Scale bars = 1 mm.

Description. Rostrum longer than carapace; dorsal margin of rostrum with 7 teeth, proximal 3 of which stand upon carapace; ventral margin with 5 teeth. Carapace with well-developed antennal tooth and pterygostomial tooth as well as moderate branchiostegal tooth. Several tufts of long and dense plumose hairs studded on body. Orbital margin double; eye big with distinct ocellar spot; cornea shorter than stalk. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth; sixth abdominal somite with movable plate articulated near posteroventral angle. Telson with 2 pairs of dorsal spines; posterior margin bearing 3 big spines and 2 small spines.

Basal segment of antennular peduncle longer than combination of second and third segment; dorsal margin of third segment with sharp triangular spine, which apex reaching midpoint of antennal scale; stylocerite obviously overreaching distal margin of second segment of antennular peduncle. Antennal scale slender, 4 times as long as wide; distolateral spine of antennal scale far more exceeding rounded distal margin of blade. Third maxilliped falling short of distal margin of antennal scale; distal end of antepenultimate segment with 2 well-developed protrusions; exopod well developed; ultimate segment with 6–8 corneous spines distally. First to fourth pereopods with epipods and arthrobranch.

Adult males showing well-represented secondary sexual character with first pereopod; which so much developed and overreaching distal margin of antennal scale by dactylus; chela long, about 2.2 times as long as carpus; propodus well developed; females with first pereopod normally, reaching near midpoint of antennal scale; chela about 1.4 times as long as carpus.

Second pereopod slightly overreaching distal margin of antennal scale; carpus subdivided into 9–13 articles. Third to fifth pereopods with similar structure. Merus of third to fifth pereopod each with only distolateral spine; flexor margin of biunguiculate dactylus armed with 3–4 accessory spinules, propodus with row of 8–10 spinules along entire length of flexor margin. Second pleopod in male with appendix masculine moderately stout, about half length of appendix interna.

Coloration in life. Carapace and abdominal somites including antennal peduncle and antennal scale mottled with many dark brown spots; rostrum green, with a few small pale yellow spots; third maxilliped and pereopods with some deep brownish-green stripes and streaks on ground colour of yellowish-green; uropod ornamented with large circular patch.

Distribution. South China Sea; widely distributed in India-West Pacific, Red Sea, Madagascar, Seychelles Islands, Dammam Islands, Ryukyu Islands, Philippines, Indonesia, and New Caledonia; inhabiting warm tropical shallow water and coral reefs.

3.2.1.4 *Thinora* Bruce, 1998

Thorina Bruce, 1997: 14, figs. 1–6. Type species: *Thor maldivensis* Borradaile, 1915.

Thinora Bruce, 1998: 398.

Gender. Feminine.

Diagnosis. Dorsal margin of rostrum with only 1 tooth; carapace with supraorbital tooth and antennal tooth, without pterygostomial tooth; third segment of antennular peduncle with subtriangular dorsal scale; mandible only with molar process and incisor process; third maxilliped with exopod; carpus of second pereopod subdivided into 6 articles; all pereopods without arthrobranch.

Distribution. Xisha Islands, Nansha Islands; Throughout most of Indo-West Pacific, Kenya, Tanganyika, Mauritius, Seychelles Islands, Maldives Islands, Laccadive Islands, Solomon Island, Dammam Islands, Ryukyu Islands, Cartire reefs, Great Barrier Reef, Papua New Guinea, Mariana Islands, Marshall Islands, Cook Islands, Kiribati, and Hawaii; common in shallow coral reefs.

Remarks. Bruce (1997) established a new genus, *Thorina* based on *Thor maldivensis* Borradaile, 1915, and he changed the name of the genus *Thorina* as *Thinora* which has been in use ever since Bruce (1998).

To date, two species of *Thinora* have been recorded from the China seas, including a new species. They can be distinguished by the following key.

Key to species of the genus *Thinora* from China seas.

1. Chela of first pereopod or second pereopod slender, cone-shaped; merus of first pereopod without acute tooth distally *T. leptochelus* sp. nov.
- Chela of first pereopod or second pereopod not cone-shaped; merus of first pereopod with an acute tooth distally *T. maldivensis* Borradaile, 1915

Thinora leptochelus sp. nov. (Fig. 7)

Material examined. Holotype, ovig. ♀, MBM136585, cl 2.05 mm, coral reef, Xisha Islands, 1957-4-29.

Description. Rostrum much shorter than carapace; dorsal and ventral margins each with only one tooth. Carapace with sharp supraorbital tooth and antennal tooth, without pterygostomian tooth. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth; sixth somite 1.4 times as long as fifth somite. Telson 1.5 times as long as

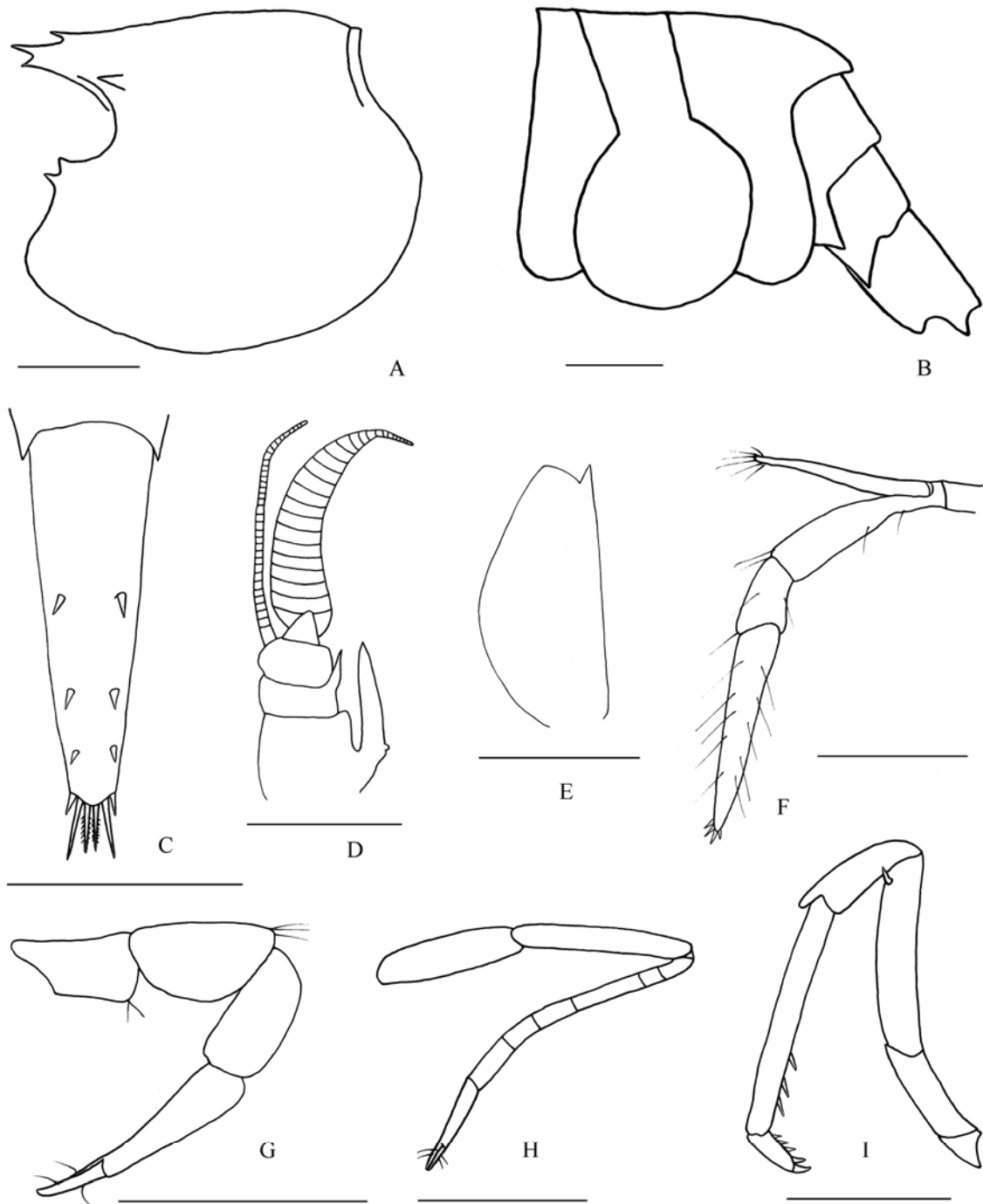


Fig. 7. *Thinora leptochelus* sp. nov. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Telson, dorsal view; D. Antennule, dorsal view; E. Antennal scale, dorsal view; F. Third maxilliped, lateral view; G. First pereopod, lateral view; H. Second pereopod, lateral view; I. Third pereopod, lateral view. Scale bars = 1 mm.

sixth somite; dorsal surface with 3 pairs of dorsolateral spines and posterior margin with 2 pairs of spines and 1 mesial pair of stiff setulose setae.

Eye pyriform, cornea with distinct ocellar spot, slightly shorter than stalk. Antennular peduncle reaching midpoint of antennal scale; second segment with acute distolateral spine; third segment of antennular peduncle with subtriangular dorsal scale; stylocerite reaching distal margin of antennular peduncle, armed with little indistinct tooth near proximal end of lateral margin. Antennal scale 2.1 times as long as wide; lateral margin straight, with distolateral tooth reaching rounded distal margin of blade. Antennal peduncle with basicerite bearing strong ventrolateral distal tooth.

Third maxilliped with exopod; reaching distal margin of antennal scale; ultimate segment with 8 corneous spines distally; antepenultimate segment subequal in length to ultimate segment. First pereopod reaching distal 1/4 of antennal scale; chela slender and cone-shaped; dactylus 0.4 times as long as palm; carpus 0.6 times as long as chela; merus subequal in length to carpus. Second pereopod overreaching distal margin of antennal scale by dactylus; chela small, slender and cone-shaped; dactylus 0.4 times as long as palm; carpus 2.6 times as long as chela; carpus subdivided into 6 articles, of which proximal third one longest; merus about 0.7 times as long as carpus; ischium thicker and shorter than merus. Third pereopod overreaching distal margin of antennal scale by dactylus and 1/4 length of propodus; flexor margin of biunguiculate dactylus with 3 spinules; distal half of flexor margin of propodus with 6–8 spinules; carpus about 0.4 times as long as propodus; merus shorter than propodus, armed with 1 distolateral spine. Fourth and fifth pereopods similar to third pereopod. Fourth pereopod reaching distal margin of antennal scale; merus with 1 distolateral spine. Fifth pereopod overreaching midpoint of antennal scale by dactylus; outer margin of merus unarmed.

Distribution. Xisha Islands, South China Sea.

Etymology. The Greek “*leptos*”, slender, fine, “*chēlē*”, claw, unguis. The specific name indicates the chelae of first and second pereopods being slender and cone-shaped.

Remarks. This new species is described based on only an ovigerous female specimen. We put it in the genus *Thinora* rather than *Thor* because it bears only 1 tooth on the dorsal margin of rostrum, and the carapace lacks pterygostomian tooth. The new species can be easily distinguished from the only known species of the genus, *Thinora maldivensis* (Borradaile, 1915), by the developed supraorbital tooth and the slender and cone-shaped chelae of the first 2 pereopods. Additionally, the unarmed merus of first pereopod in the new species is also different from that of *T. maldivensis* which has 1 acute distolateral tooth.

***Thinora maldivensis* Borradaile, 1915 (Fig. 8)**

Thor maldivensis Borradaile, 1915: 208; 1917: 401, fig. 6; Kemp, 1916: 391; Edmondson, 1925: 6; 252, fig. 153d; Bruce, 1976: 51.

Type locality: Male Atoll, Maldive Islands.

Thor spinosus Boone, 1935: 192.

Thorina maldivensis Bruce, 1997: 14, figs. 1–6.

Thinora maldivensis Bruce, 1998: 398.

Material examined. MBM136537, 1 ♂ (cl 1.73 mm), 3 ♀ (cl 0.76–1.49 mm), 6 ovig. ♀ (cl 1.31–1.87 mm), Nansha Islands, Yongshujiao reef, 1993-5-17, coll. Xin-Zheng Li; MBM136435, 1 ♀ (cl 1.15 mm), Xisha Islands, Bei Island, 1958-4-24, coll. Zhen-Gang Fan.

Description. Rostrum short, reaching near to midpoint of basal segment of antennular peduncle; dorsal margin with only 1 tooth and ventral margin unarmed. Carapace smooth, with supraorbital tooth and antennal tooth, without pterygostomian tooth. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth; sixth somite 1.3 times as long as fifth somite. Telson 1.3 times as long as sixth somite; dorsal surface with 3 pairs of dorsolateral spines and 3 pairs of terminal spines.

Basal segment of antennular peduncle broad, ventromedial margin with stout acute tooth; second segment with acute distolateral spine; third segment of antennular peduncle with subtriangular dorsal scale. Stylocerite reaching distal margin of antennular peduncle, armed with little indistinct tooth near proximal end of lateral margin. Antennal scale 2.5 times as long as wide; distolateral tooth falling short of rounded distal margin of blade.

Eye well developed; large well pigmented globular cornea with conspicuous ocellus; stalk stout, compressed. Mandible without palp; incisor process slender, with 6 tiny teeth distally; molar process well-developed.

Third maxilliped in male overreaching antennal scale by ultimate segment; third maxilliped reaching distal margin of antennal scale. First pereopods showing marked sexual dimorphism, greatly hypertrophied in some adult male. First

pereopod in female normal, reaching or slightly overreaching distal margin of antennal scale; dactylus about half length of palm; carpus 0.4 times as long as chela; merus subequal in length to chela, with 1 distolateral acute tooth. Second pereopod overreaching distal margin of antennal scale by chela; carpus subdivided into 6 articles, of which proximal third one longest; merus subequal in length to ischium.

Third pereopod overreaching distal margin of antennal scale by dactylus; flexor margin of biunguiculate dactylus with 2 spinules; flexor margin of propodus with 2 rows of 10–14 spinules; merus armed with 1 distolateral spine. Fourth and fifth pereopods similar to third pereopod; outer margin of merus generally unarmed. Second pleopod in male completely without appendix masculine.

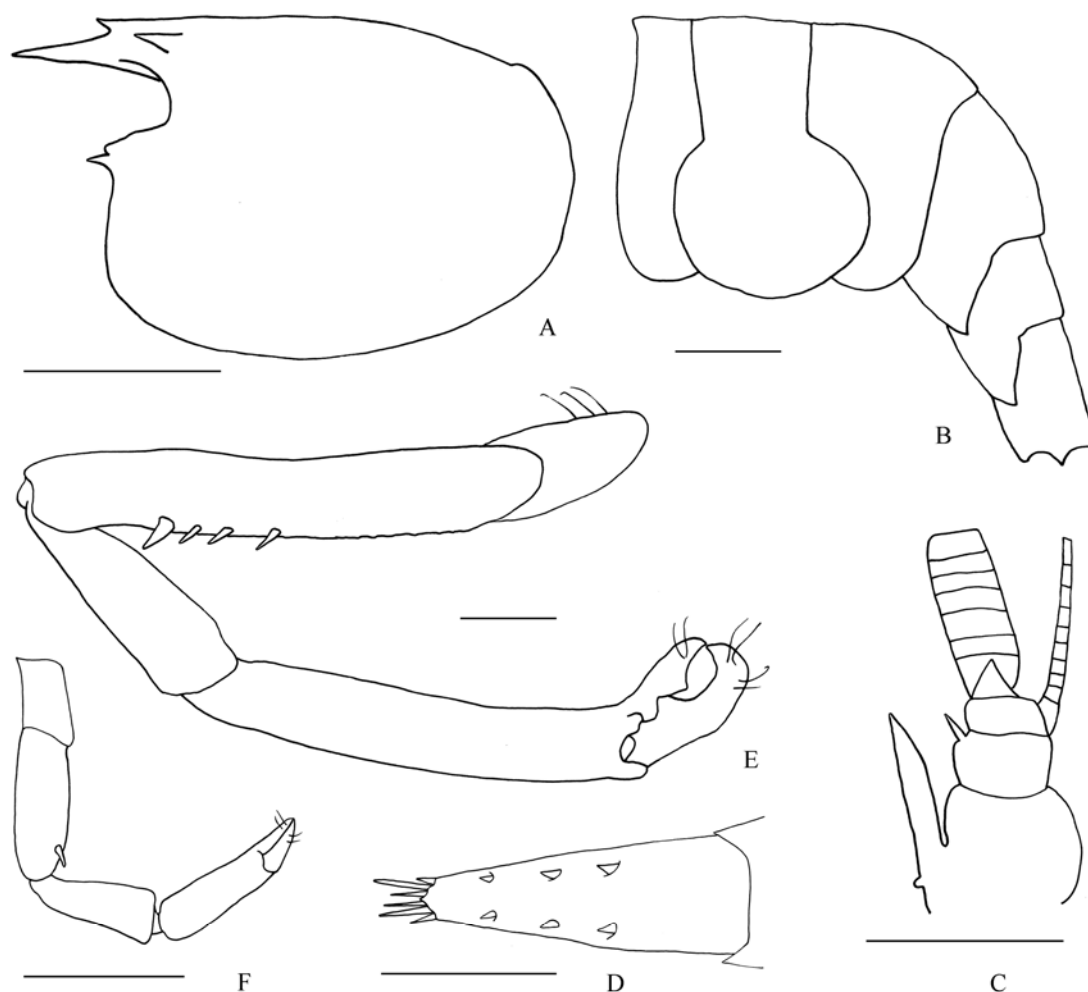


Fig. 8 *Thinora maldivensis* Borradaile, 1915. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennular peduncle, dorsal view; D. Telson, dorsal view; E. First pereopod showing marked sexual dimorphism in male, lateral view; F. First pereopod in female, lateral view. Scale bars = 1 mm.

Distribution. Xisha Islands, Nansha Islands; widely distributed in Indo-West Pacific: Kenya, Tanganyika, Mauritius, Seychelles Islands, Maldives Islands, Laccadive Islands, Solomon Island, Dammam Islands, Ryukyu Islands, Cartire reefs, Great Barrier Reef, Papua New Guinea, Mariana Islands, Marshall Islands, Cook Islands, Kiribati, and Hawaii Islands; 0–5 m.

Remarks. Not all the adult males with first pereopods have distinct sexual dimorphism, the first pereopods of some adult males are similar to those of females.

3.2.1.5 *Tozeuma* Stimpson, 1860

Tozeuma Stimpson, 1860: 26. Type species: *Tozeuma lanceolatum* Stimpson, 1860.

Gender. Neuter.

Diagnosis. Mandible only with molar process; third maxilliped with ultimate segment flattened, without exopod, with arthrobranch but without epipod or coxal endite; Pereopods without exopods, epipods, or arthrobranches; carpus of second pereopod subdivided into 3 articles.

Distribution. East China Sea, South China Sea; Red Sea and South Africa to Hong Kong, Japan, Philippines, Indonesia, Australia, New Zealand and Western Atlantic from Massachusetts to Bahia, Brazil; 0–100 m.

Remarks. To date, two species of *Tozeuma* have been certainly recorded from the China seas. They can be distinguished by the following key.

Key to species of the genus *Tozeuma* from China.

1. Integument smooth and bare; rostrum more than twice as long as carapace *T. lanceolatum* Stimpson, 1860
Integument hirsute; rostrum subequal in length to carapace *T. tomentosum* (Baker, 1904)

Tozeuma lanceolatum Stimpson, 1860 (Fig. 9)

Tozeuma lanceolatum Stimpson, 1860: 27; Bruce, 1990: 594, figs. 18–22; Chace, 1997: 95, fig. 29. Type locality: Hong Kong.

Material examined. MBM214933, 1 ♀ (cl 8.16 mm), Beibu Gulf, South China Sea, 1959-12-10, st.6231, 58 m, muddy sand, AT, no. X35B-5, coll. Zhen-Gang Fan; MBM214934, 1 ♂ (cl 6.37 mm), Beibu Gulf, South China Sea, 1960-7-8, st.6241, sandy mud, 58.9 m, AT, no. K220B-26; MBM214935, 1 ovig. ♀ (cl 8.83 mm), Beibu Gulf, South China Sea, 1960-4-17, st.6179, 14 m, sandy mud, AT, no. Q183B-8, coll. Fu-Zeng Sun; MBM214936, 11 ♂ (cl 4.81–6.24 mm), 3 ovig. ♀ (cl 7.26–9.31 mm), Beibu Gulf, South China Sea, 1962-8-16, st.7905, 26 m, fine sand, AT, no. X224B-58; MBM136421, 1 ♀ (cl 7.53 mm), Guangdong, Yeshe, 1955-1-14, no.55-K027; MBM136409, 5 ♀ (cl 7.09–8.83 mm), Hainan, Ledong, Yinggehai, 1955-12-11, no.55-K453; MBM136408, 1 ♀ (cl 8.28 mm), Hainan, Ledong, Yinggehai, 1955-12-11, no.55K-469; MBM214938, 1 ♂ (cl 4.26 mm), Beibu Gulf, South China Sea, 1960-2-12, st.6272, 42.5 m, muddy sand, AT, no. X78B-23, coll. Zhen-Gang Fan; MBM214939, 1 ovig. ♀ (cl 7.67 mm), Beibu Gulf, South China Sea, 1960-11-9, st.6179, 15 m, mud, AT, no. Q286B-25, coll. Bao-Lin Zhang; MBM214940, 2 ovig. ♀ (cl 7.77, 7.81 mm), Beibu Gulf, South China Sea, 1959-12-12, st.6179, 21.8 m, mud, AT, no. R117B-20; MBM214941, 1 ovig. ♀ (cl 8.56 mm), Beibu Gulf, South China Sea, 1962-4-22, st.7104, 32 m, fine sand, AT, no. X215B-37; MBM214942, 1 ♀ (cl 8.56 mm), Beibu Gulf, South China Sea, 1962-1-14, st.7404, 58 m, sand, AT, no. X161B-12, coll. Fu-Zeng Sun; MBM214944, 1 ♀ (cl 8.56 mm), Beibu Gulf, South China Sea, 1959-12-7, st.6229, 38 m, muddy sand, AT, no. X19B-23, coll. Xiu-Tong Ma; MBM214945, 1 ♂ (cl 5.98 mm), Beibu Gulf, South China Sea, 1960-2-4, st.6218, 65.5 m, sandy mud, AT, no. X50B-18, coll. Zhen-Gang Fan; MBM214946, 1 ♂ (cl 6.03 mm), Beibu Gulf, South China Sea, 1962-8-19, st.7606, 68 m, find sand and mud, AT, no. X239B-39, coll. Fu-Zeng Sun; MBM214947, 1 ovig. ♀ (cl 10.03 mm), Beibu Gulf, South China Sea, 1962-4-20, st.7303, 34 m, sand, AT, no. X211B-81; MBM214952, 1 ♂ (cl 7.43 mm), Beibu Gulf, South China Sea, 1962-4-9, st.7904, 82 m, sand and mud, AT, no. X184B-33, coll. Fu-Zeng Sun; MBM214954, 1 ♂ (cl 6.08 mm), Beibu Gulf, South China Sea,

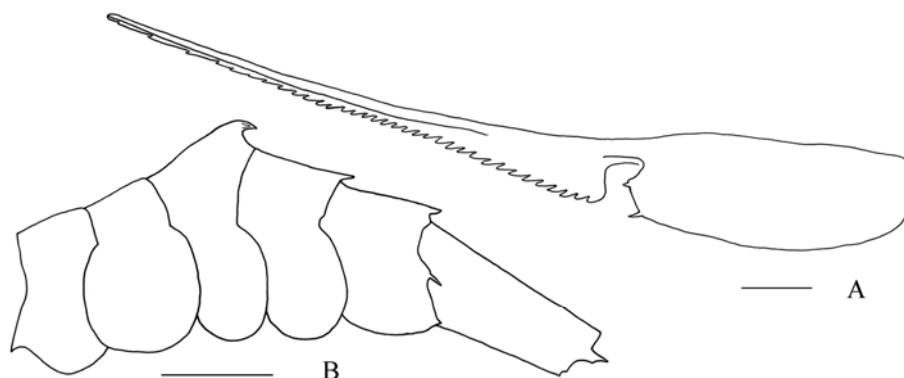


Fig. 9. *Tozeuma lanceolatum* Stimpson, 1860. A. Carapace, lateral view; B. Abdominal pleurae, lateral view. Scale bars = 1 mm.

1960-2-17, st.6197, 26m, mud, AT, no. Q254B-35, coll. Fu-Zeng Sun.

Description. Integument smooth and bare, not hirsute. Rostrum fully twice as long as remainder of carapace, unarmed dorsally, armed ventrally with 20–40 teeth. Carapace with antennal tooth and well-developed pterygostomial tooth.

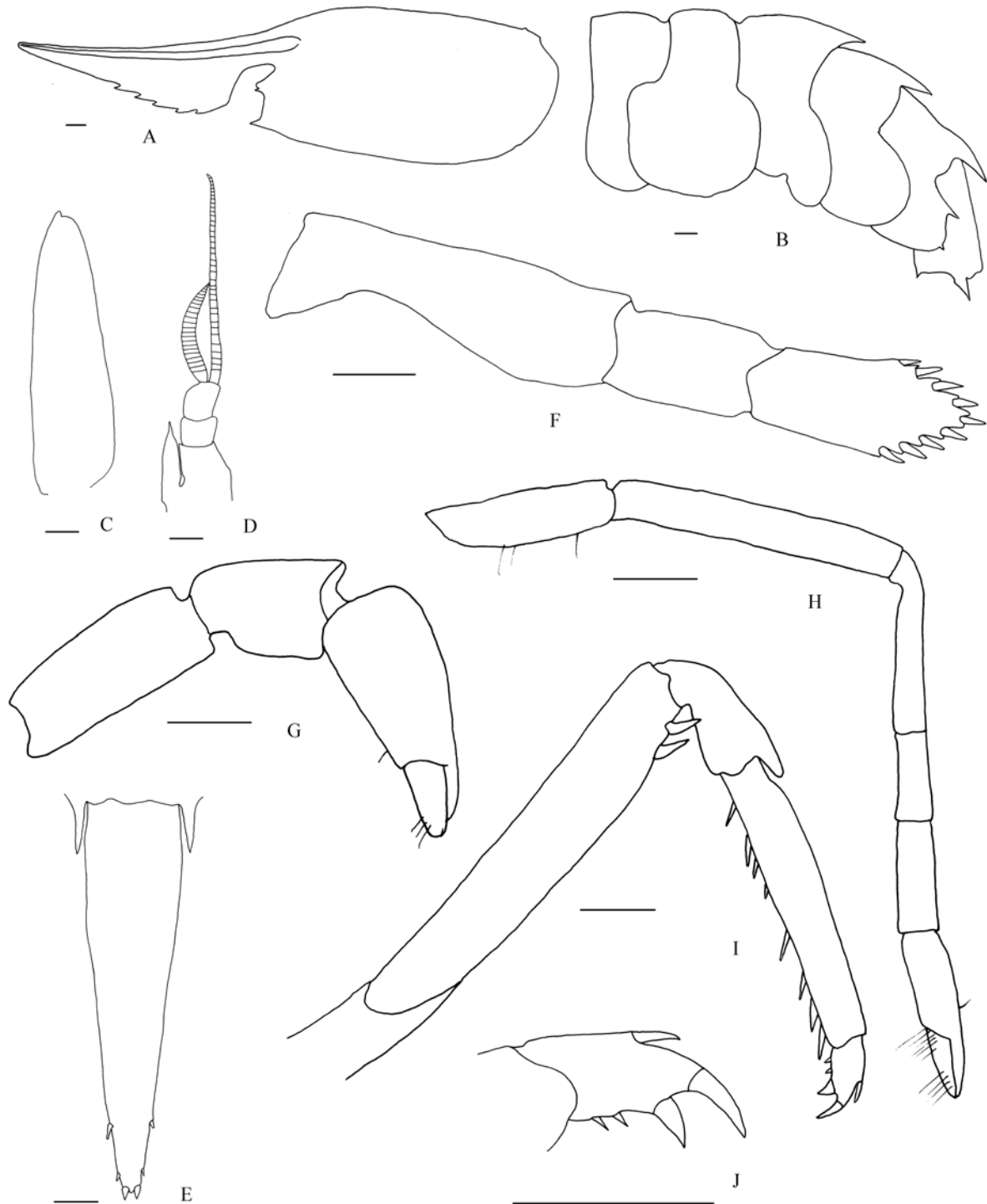


Fig. 10. *Tozeuma tomentosum* (Baker, 1904). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennal scale, dorsal view; D. Antennule, dorsal view; E. Telson, dorsal view; F. Third maxilliped, lateral view; G. First pereopod, lateral view; H. Second pereopod, lateral view; I. Third pereopod, lateral view; J. Dactylus of third pereopod, lateral view. Scale bars = 1 mm.

Abdomen with third to fifth somites dentate posteriorly; third somite with flattened dorsal carina, typically tridentate posteriorly; fifth somite with 2 teeth on posteriormargin of pleura. Telson posteriorly bifid, 1.2 times as long as sixth somite; dorsal margin with 3 pairs of spines. Distal margin of 3 segments of antennular peduncle unarmed; stylocerite overreaching distal margin of basal segment but not reaching midpoint of second segment of antennular peduncle. Antennal scale long and narrow, 7.3 times as long as wide; with 1 sharp spine distally.

Third maxilliped thick and short; ultimate segment flattened, with 8–10 corneous spines distally. First pereopod reaching base of pterygostomian tooth; dactylus about half length of palm; carpus about 0.6 times as long as chela; merus about 1.4 times as long as carpus. Carpus of second pereopod subdivided into 3 articles, of which proximal one longest; merus subequal in length to carpus; ischium about 0.6 times as long as merus. Ambulatory pereopods similar in structure; dactylus simple, not biunguiculate, flexor margin with 4–5 spinules; propodus with 2 rows of 8–12 spinules along entire length of flexor margin; merus generally armed with only 1 distolateral spine. Appendix masculina of second pleopod about twice length of appendix interna.

Distribution. East China Sea, South China Sea; Singapore, Philippines; 30–140 m.

***Tozeuma tomentosum* (Baker, 1904) (Fig. 10)**

Tozeuma tomentosum Baker, 1904: 156, pl. 30. Type locality: the gulfs and coast of South Australian.

Material examined. MBM046799, 1 ovig. ♀ (cl 13.71 mm), South China Sea, 1959-2-16, st. 6091, 80 m, sandy mud, AT, no. 4-25, coll. Zhi-Can Tang; MBM081148, 1 ovig. ♀ (cl 14.97 mm), South China Sea, 1959-4-8, st. 6036, 102 m, mud, AT, no. S67B-1, coll. Shao-Zhong Wu; MBM046802, 1 ♂ (cl 6.17 mm), 1 ♀ (cl 15.36 mm), South China Sea, 1959-4-25, st. 6141, 78 m, sandy mud, AT, no. L65B-34, coll. Xiu-Tong Ma.

Description. Integument hirsute, not smooth. Rostrum subequal in length to carapace, unarmed dorsally, armed ventrally with 5 teeth; lateral carina well developed, reaching behind orbital margin. Carapace with antennal tooth and strong pterygostomian tooth. Abdomen with third to fifth somites dentate posteriorly; fifth somite with 2 teeth on posteriormargin of pleura. Telson about 1.7 times as long as sixth somite; distal 1/3 of dorsal surface with 2 pairs of spines; posterior margin with 1 pair of oval-shaped spines.

Distal margin of 3 segments of antennular peduncle unarmed; stylocerite overreaching distal margin of second segment of antennular peduncle. Antennular peduncle not reaching midpoint of antennal scale. Antennal scale slender, 3.6 times as long as wide; with 1 spine distomedially.

Third maxilliped without exopod, reaching distal end of antennular peduncle; ultimate segment flattened, with 9 or 10 corneous spines distally. First pereopod thick and short; dactylus about 0.4 length of palm; chela about 2.2 times as long as carpus; merus about 1.7 times as long as carpus.

Second pereopod reaching distal end of antennular peduncle; chela small; dactylus shorter than palm; carpus subdivided into 3 articles, of which proximal one longest; merus 0.8 times as long as carpus; ischium about 0.6 times as long as merus. Ambulatory pereopods similar in structure; dactylus simple, not biunguiculate, flexor margin with 4–5 spinules; propodus with 2 rows of 8–12 spinules along entire length of flexor margin; merus generally armed with only 1 distolateral spine.

Extensor margin and distal end of dactylus each with 1 sharp spine; flexor margin of dactylus with 1 spine and 2 spinules; propodus with 7–10 spines along entire length of flexor margin; outer margin of merus armed with 1 or 2 sharp distolateral spines.

Distribution. South China Sea; Ryukyu Islands and Australian waters; 30–120 m.

3.2.2 Lysmatidae Dana, 1852

Lysmatinae Dana, 1852b: 16, 20. Type genus: *Lysmata* Risso, 1816.

Lysmatidae Christoffersen, 1987: 350 (listed in Superfamily Crangonoidea; including genera: *Calliasmata* Holthuis, 1973, *Exhippolysmata* Stebbing, 1915, *Lysmata* Risso, 1816, *Mimocaris* Nobili, 1903).

Lysmatidae De Grave *et al.*, 2014: 501 (resurrection; including genera: *Exhippolysmata* Stebbing, 1915, *Ligur* Sarato, 1885, *Lysmata* Risso, 1816, *Lysmatella* Borradaile, 1915, *Mimocaris* Nobili, 1903).

To date, three genera of the family Lysmatidae have been found from China seas. They can be distinguished by the following key.

Key to genera of Lysmatidae from China seas.

1. Carapace with dentate crest in midline at base of rostrum *Exhippolysmata* Stebbing, 1915
 Carapace without dentate crest in midline at base of rostrum 2
2. Four anterior pairs of pereopods with epipods *Lysmata* Risso, 1816
 Pereopods without epipods *Lysmatella* Borradaile, 1915

3.2.2.1 *Exhippolysmata* Stebbing, 1915

Exhippolysmata Stebbing, 1915: 94. Type species: *Hippolysmata ensirostris* Kemp, 1914.

Gender. Feminine.

Diagnosis. Rostrum longer than carapace; carapace anteriorly with high crest which being thin and continuous with

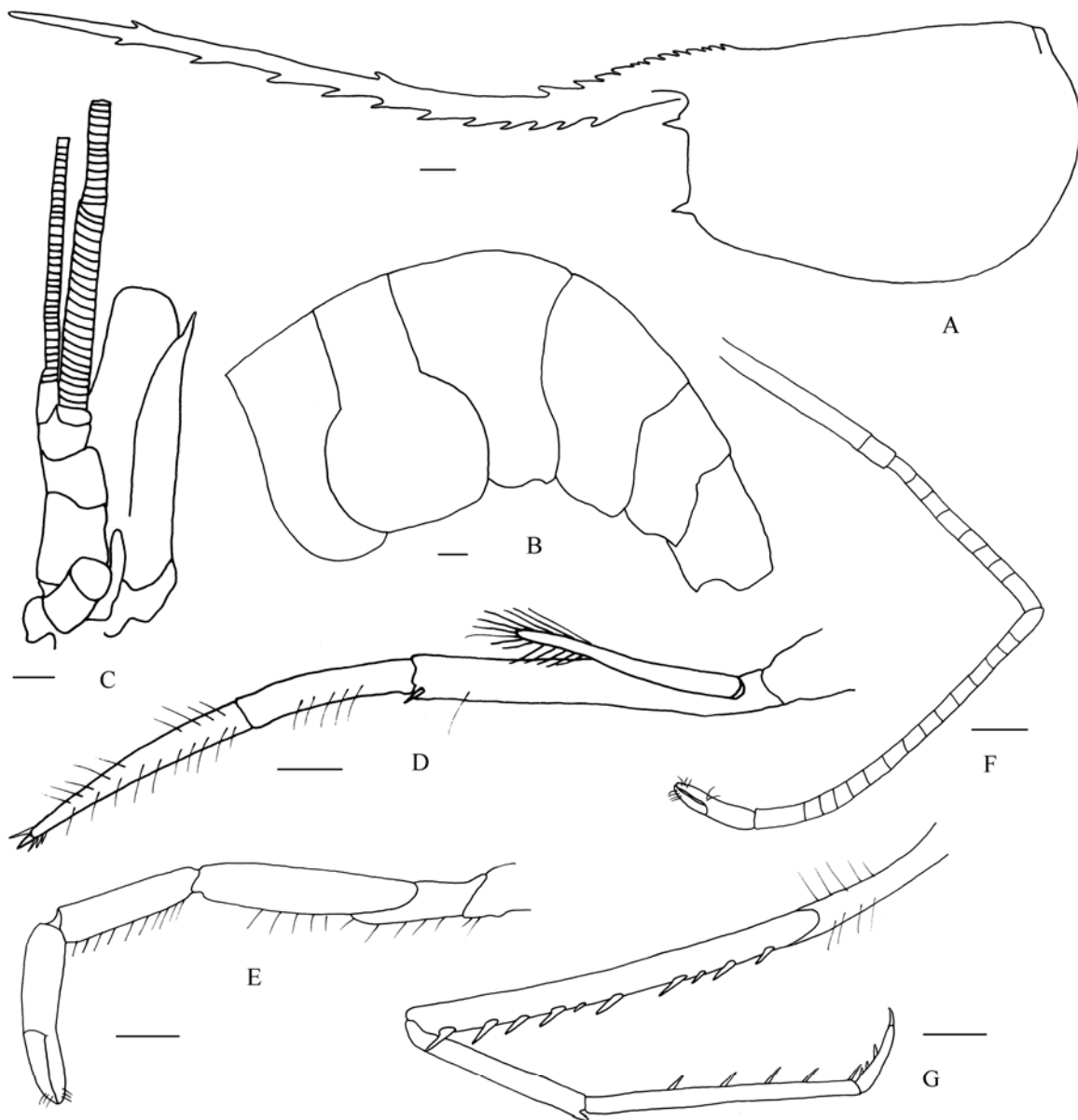


Fig. 11. *Exhippolysmata ensirostris ensirostris* (Kemp, 1914). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennular peduncle and antennal scale, dorsal view; D. Third maxilliped, lateral view; E. First pereopod, lateral view; F. Second pereopod, lateral view; G. Third pereopod, lateral view. Scale bars = 1 mm.

proximal part of rostrum; 7–12 small teeth present on crest. Carapace without supraorbital spine; mandible only with molar process; third maxilliped with distal segment not flattened, with exopod, epipod and arthrobranch; pereopods without arthrobranch, with terminally hooked epipods on anterior pairs; carpus of second pereopod subdivided into 12–22 articles.

Distribution. East China Sea, South China Sea; South Africa, India to Indonesia, western Atlantic from North Carolina to Sao Paulo, Brazil, and western Africa from Cameroon to Northern Angola; 1–100 m, occasionally in fresh water.

Remarks. To date, only one species of the genus has been found from the China seas.

***Exhippolysmata ensirostris ensirostris* (Kemp, 1914) (Fig. 11)**

Hippolysmata ensirostris Kemp, 1914: 113, 118, figs. 1–4. Type locality: Colombo, Sri Lanka.

Hippolysmata (*Exhippolysmata*) *ensirostris* Holthuis, 1947: 74.

Exhippolysmata ensirostris ensirostris Chace, 1997: 65.

Material examined. MBM042360, 5 ovig. ♀ (cl 9.28–13.16 mm), East China Sea, 1959-12-9, st. 4082, 81 m, sand and gravel, AT, no. D143B-23, coll. Yu-Heng Cui.

Description. Long rostrum with apically upwards; 1.9 times longer than carapace; carapace with dentate crest in midline at base of rostrum; rostral crest composed of 7–12 teeth, followed by 2–6 teeth on remaining dorsal margin of rostrum; ventral margin armed with 7–16 teeth; carapace with antennal and pterygostomian teeth.

Pleura of fifth abdominal somites with small posteroventral tooth; sixth somite 1.3 times as long as fifth. Telson about 1.9 times as long as sixth abdominal somite; dorsal surface with 2 pairs of dorsolateral spines; posterior margin with 1 pairs of spines and 1 mesial pair of stiff setulose setae.

Basal segment of antennular peduncle subequal in length to distal two segments combined. Stylocerite not reaching end of basal segment. Third segment with small marginal spine on top of segment. Antennal scale 2.9 times as long as wide, with distolateral tooth falling short of rounded distal margin of blade.

Third maxilliped reaching distal margin of antennal scale, with developed exopod; ultimate segment with 5–8 corneous spines distally. First pereopod reaching middle of antennal scale with chela not expanded. Second pereopod reaching or slightly overreaching distal margin of antennal scale, distal of ischium with one sub-article; merus subdivided into 7–10 articles and carpus subdivided into 12–22 articles. Third to fifth pereopods with similar structure; merus with 7–12 acute spines, dactylus unguiculate with three spines on flexor margin; flexor margin of propodus with many slender spinules.

Distribution. East China Sea, South China Sea; India, Sri Lanka, Burma, and Sumatra and Java, Indonesia; 1–100 m.

3.2.2.2 *Lysmata* Risso, 1816

Lysmata Risso, 1816: 175. Type species: *Aglaope striata* Rafinesque, 1814.

Arno Roux, 1831: 18, 19.

Eretmocaris Bate, 1888: 894.

Gender. Feminine.

Diagnosis. Carapace with small tooth on gastric region; with antennal tooth and without supraorbital tooth; antennular peduncle bearing dorsal flagellum and ventral flagellum; mandible only with molar process; third maxilliped with exopod; first to fourth pereopods with epipods; carpus of second pereopod subdivided into many articles.

Distribution. Pantropical and subtropical, occasionally temperate; commonly littoral and sublittoral; 0–300 m.

Remarks. To date, two species of the genus *Lysmata* have been certainly reported from the China seas. They can be distinguished by the following key.

Key to species of the genus *Lysmata* from China seas.

1. Dorsal antennular flagellum with distinct accessory branch of about 10–15 articles *Lysmata ternatensis* De Man, 1902
- Dorsal antennular flagellum without accessory branch *Lysmata vittata* (Stimpson, 1860)

***Lysmata ternatensis* De Man, 1902 (Fig. 12)**

Lysmata seticaudata var. *ternatensis* De Man, 1902: 846. Type locality: Temate, Indonesia, possibly also Ambon and, less likely, Japan.

Hippolysmata acicula Rathbun, 1906: 912, pl. 24, fig. 6.

Lyismata affinis Borradaile, 1915:209.

Lyismata dentata Holthuis, 1947:64.

Lyismata ternatensis Chace, 1997: 77.

Material examined. MBM129611, 2 ♂ (cl 3.11, 3.62 mm), 1 ovig. ♀ (cl 5.19 mm), 1 ♀ (cl 4.66 mm), Hainan, Xisha Islands, Shanhu Island, 1980-5-19, no.80X-157; MBM136640, 1 ovig. ♀ (cl 6.55 mm), Bei Island, 1957-4-30; MBM136606, 1 ♂ (cl 4.89 mm), Shandong, Rongcheng, Shi Island, 1957-5-13; MBM136451, 1 ♀ (cl 5.69 mm), Shandong, Rongcheng, Shi Island, 1958-4-6, no.58C-140, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM136457, 1 ovig. ♀ (cl 4.72 mm), Hainan, Nansha Islands, Wude Island, 1958-3-31, no.56C-093, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM136442, 1 ♀ (cl 3.26 mm), Hainan, Xisha Islands, Celiang Beach, 1958-4-28, no.58C-612, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM136528, 1 ♂ (cl 3.11 mm), Hainan, Nansha Islands, Wude Island, 1957-5-17, no.57-109.

Description. Rostrum short, nearly straight, slightly descending, reaching midpoint of antennal scale; dorsal margin with 4–6 teeth; ventral margin with 2–4 teeth distally. Carapace with antennal tooth, tiny pterygostomian tooth and bearing with small tooth on gastric region. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Sixth somite 1.8 times as long as fifth mid-dorsal length. Telson about 1.8 times as long as sixth somite; dorsal surface with 2 pairs of dorsolateral spines; posterior margin of telson with 1 pair of spines and 1 mesial pair of stiff setulose setae.

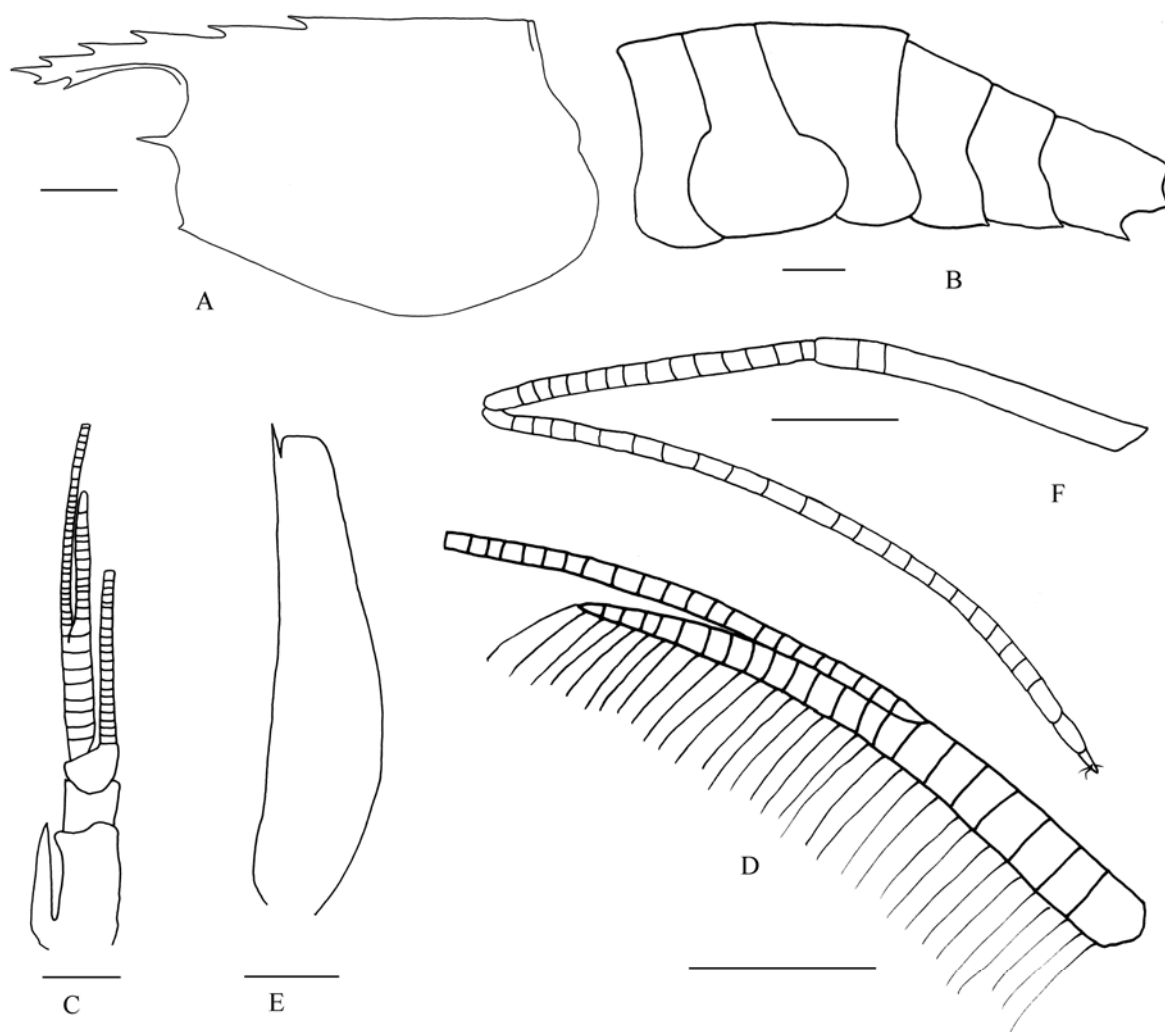


Fig. 12. *Lyismata ternatensis* De Man, 1902. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennule, dorsal view; D. Dorsal antennular flagellum, lateral view; E. Antennal scale, dorsal view; F. Second pereopod, lateral view. Scale bars = 1 mm.

Antennular and antennal flagellums developed; dorsal antennular flagellum with distinct accessory branch of about 10–15 articles; first segment of antennular peduncle longer than combination of second and third segments; stylocerite reaching distal end of first segment of antennular peduncle; second segment reaching midpoint of antennal scale. Antennal scale slender, 4.1 times as long as wide; lateral margin ending in spine beyond lamella.

Third maxilliped with exopod; overreaching antennal scale by half length of ultimate segment which with 6–8 corneous spines distally. First pereopod slightly overreaching distal margin of antennal scale; dactylus about half length of palm; carpus slightly shorter than chela; merus being in same length with chela. Second pereopod slender; carpus subdivided into 20–28 articles; merus subdivided into 12–18 articles; distal one third part of ischium with 2 articles.

Third to fifth pereopods with similar structure. Third pereopod overreaching distal margin of antennal scale by propodus; flexor margin of biunguiculate dactylus with 3–4 spinules; flexor margin of propodus with 6–10 spinules; merus with 3–7 distolateral spines. Merus of fourth pereopod with 2–5 distolateral spines. Fifth pereopod overreaching antennal scale by dactylus; merus with 1–3 distolateral spines.

Distribution. Yellow Sea, East China Sea, South China Sea; Seychelles, Laccadives, Chagos Archipelago, Japan, Indonesia; 0–50 m.

***Lysmata vittata* (Stimpson, 1860)** (Fig. 13)

Hippolysmata vittata Stimpson, 1860: 26. Type locality: Hong Kong.

Nauticaris unirecedens Bate, 1888: 608, fig. 1.

Hippolysmata durkanensis Stebbing, 1921: 20.

Hippolysmata (*Hippolysmata*) *vittata* Hayashi & Miyake, 1968: 156, fig. 17; Bruce, 1990: 601, figs. 23–28.

Lysmata vittata Chace, 1997: 78.

Material examined. MBM136566, 2 ♂ (cl 2.99, 3.68 mm), 2 ovig. ♀ (cl 5.33, 6.08 mm), 1 ♀ (cl 3.80 mm), Hainan, Sanya, 1955-12-4, no.55-K431, coll. Rui-Yu Liu; MBM136583, 1 ♀ (cl 5.49 mm), Zhejiang, Zhoushan, Shenjiamen, 1955-4-19, no.53-016; MBM109852, 1 ovig. ♀ (cl 7.82 mm), Fujian, Chongwu, 1975-6-22, coll. Hui-Lian Chen; MBM136440, 1 ♀ (cl 3.11 mm), Hainan, Lingao, Xinying, Linchang, 1990-12-3; MBM136534, 3 ♀ (cl 5.37–6.14 mm), Hainan, Xisha Islands, Celiang Beach, 1954-8-30; MBM136468, 1 ovig. ♀ (cl 6.49 mm), Hainan, Lingao, Xinying, Linchang, 1992-8-9, no.92C-1436; MBM136649, 1 ♂ (cl 4.68 mm), 1 ♀ (cl 4.83 mm), Hainan, Ledong, Yinggehai, 1955-5-5, no.55-K229, coll. Yong-Liang Wang; MBM129621, 1 ♂ (cl 5.12 mm), 1 ♀ (cl 5.76 mm), Fujian, Dongping, 1954-11-9, no.54-135C; MBM129627, 1 ♂ (cl 3.43 mm), 1 ♀ (cl 6.54 mm), 3 ovig. ♀ (cl 7.51–8.63 mm), Hainan, Ledong, Yinggehai, 1957-6-27, no.57K-264, coll. Zhen-Gang Fan & Jie-Shan Xu.

Description. Rostrum short, 2/3 times as long as carapace; distal half slightly descending; reaching third segment of antennular peduncle; dorsal margin with 6–10 teeth; ventral margin with 3–6 teeth. Carapace with antennal tooth, tiny pterygostomian tooth and bearing with small tooth on gastric region.

Abdominal smooth, Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Telson with 2 pairs of dorsal spines; posterior margin with 2 pair of spines and 1 mesial pair of stiff setulose setae.

Eye moderate, cornea slightly longer than stalk. Second segment of antennular peduncle equal in length with third one; stylocerite acute, not reaching basal segment of antennular peduncle; dorsal antennular flagellum without accessory branch.

Antennal scale short, 3.2 times as long as wide; reaching distal end of antennular peduncle; lateral margin straight, ending in spine beyond lamella. Mandible only with molar process, without incisor process and palp. Third maxilliped slender, with exopod; ultimate segment overreaching distal end of second segment of antennular peduncle.

First pereopod beyond apex of rostrum by chela; palm longer than dactylus but shorter than carpus. Second pereopod slender, overreaching rostrum by carpus, which subdivided into 16–22 articles; carpus 2.0 times as long as merus, which subdivided into 9–11 articles; ischium with 1 article distally; chela small, dactylus slightly shorter than propodus.

Third pereopod overreaching rostrum by all or most of carpus; flexor margin of propodus with 6–8 spinules; dactylus biunguiculate, flexor margin with 4 or 5 spinules. Fourth and fifth pereopods similar to third pereopod. Merus of third or fourth pereopod bearing 4–5 distolateral spines; merus of fifth pereopod with only 1 or 2 distolateral spines. Uropods longer than telson; endopod and exopod of equal length.

Coloration in life. Body with thick and thin red longitudinal stripes.

Distribution. China seas; Red Sea, Eastern Africa to Hong Kong, Japan, Philippines, Indonesia, and Australia; sandy sediment or coral reefs in shallow water 0–60 m.

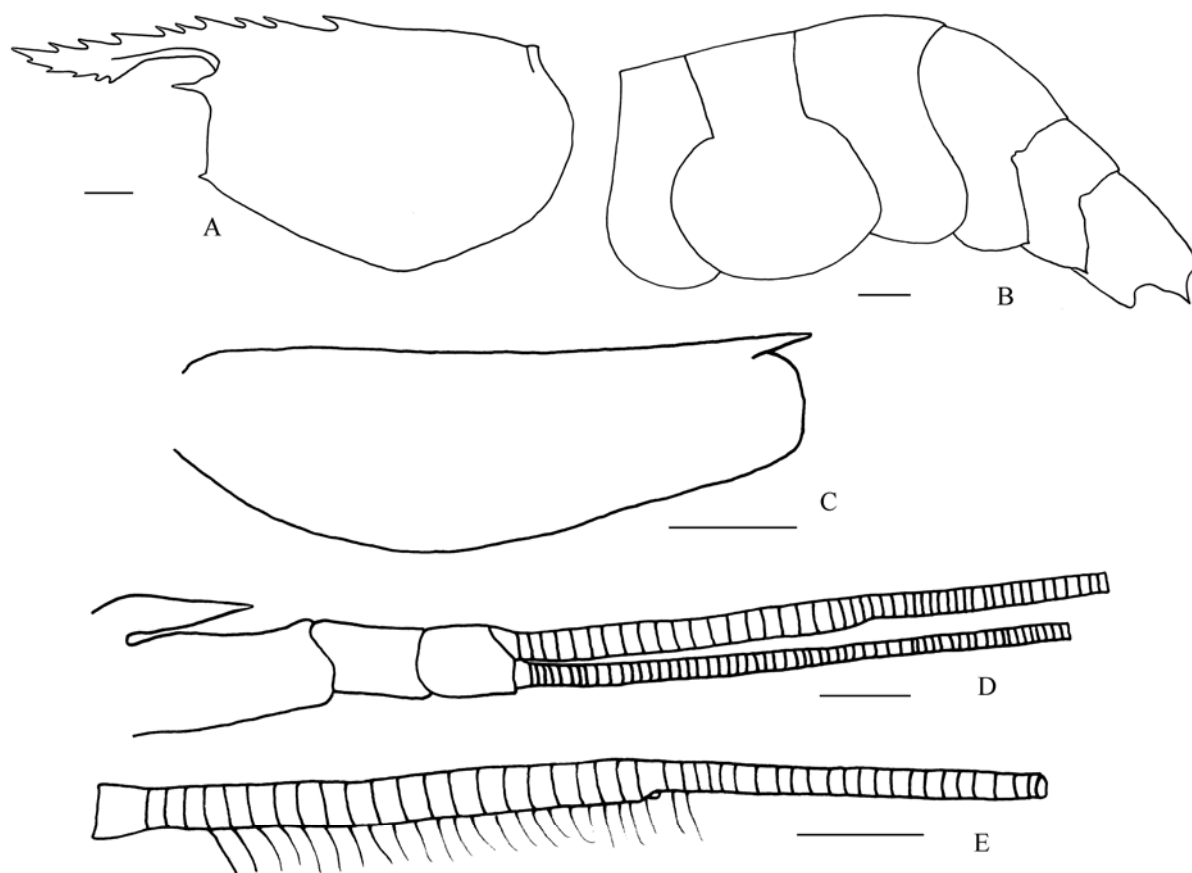


Fig. 13. *Lysmata vittata* (Stimpson, 1860). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennal scale, dorsal view; D. Antennular peduncle, dorsal view; E. Dorsal antennular flagellum, lateral view. Scale bars = 1 mm.

3.2.2.3 *Lysmatella* Borradaile, 1915

Lysmatella Borradaile, 1915: 206. Type species: *Lysmatella prima* Borradaile, 1915.

Gender. Feminine.

Diagnosis. Carapace with small tooth on gastric region; with antennal tooth, pterygostomian tooth and without supraorbital tooth; antennular peduncle bearing dorsal flagellum and ventral flagellum; mandible only with molar process; third maxilliped with exopod; all pereopods without epipod; carpus of second pereopod subdivided into many articles.

Distribution. South China Sea; Maldives and Andaman Islands, Japan, Philippines, and Indonesia; 0–60 m.

Remarks. Only one species is known in the genus *Lysmatella*. *Lysmatella* differs from *Lysmata* by the complete absence of epipod from all the pereopods, in the latter genus, strong developed epipod present on the four anterior pereopods.

Lysmatella prima Borradaile, 1915 (Fig. 14)

Lysmatella prima Borradaile, 1915: 209; 1917: 404; Chace, 1997: 78.

Hippolysmata (Lysmatella) prima Kemp, 1916: 404; Holthuis, 1947: 72.

Material examined. MBM270997, 1 ovig. ♀ (cl 4.64 mm), Beibu Gulf, South China Sea, 1960-4-13, st. 6250, 33.5 m, shell and sand, AT, no. Q173B-43, coll. Fu-Zeng Sun.

Description. Rostrum and carapace about equal in length; dorsal margin with 6–9 teeth; ventral margin with 5–7 teeth. Carapace with small tooth on gastric region; with antennal tooth and pterygostomian tooth. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Telson about 1.5 times as long as sixth somite, dorsal surface

with 2 pairs of dorsolateral spines. Apex of telson acutely pointed with two pairs of spines and one mesial pair of stiff setulose setae.

Antennular peduncle reaching distal margin of antennal scale; stylocerite short, not reaching midpoint of first segment of antennular peduncle. Antennal scale 3.6 times as long as wide; falling short of apex of rostrum; lateral margin with distolateral tooth beyond lamella. Antennular peduncle bearing dorsal flagellum and ventral flagellum; dorsal flagellum without accessory branch. Mandible only with molar process.

Third maxilliped with exopod, overreaching distal margin of antennal scale by 2/3 ultimate segment, which bearing 6–8 corneous spines distally. First pereopod overreaching antennal scale by dactylus; which 0.6 times as long as palm; merus and chela of equal length. Second pereopod overreaching antennal scale by half of carpus; dactylus shorter than

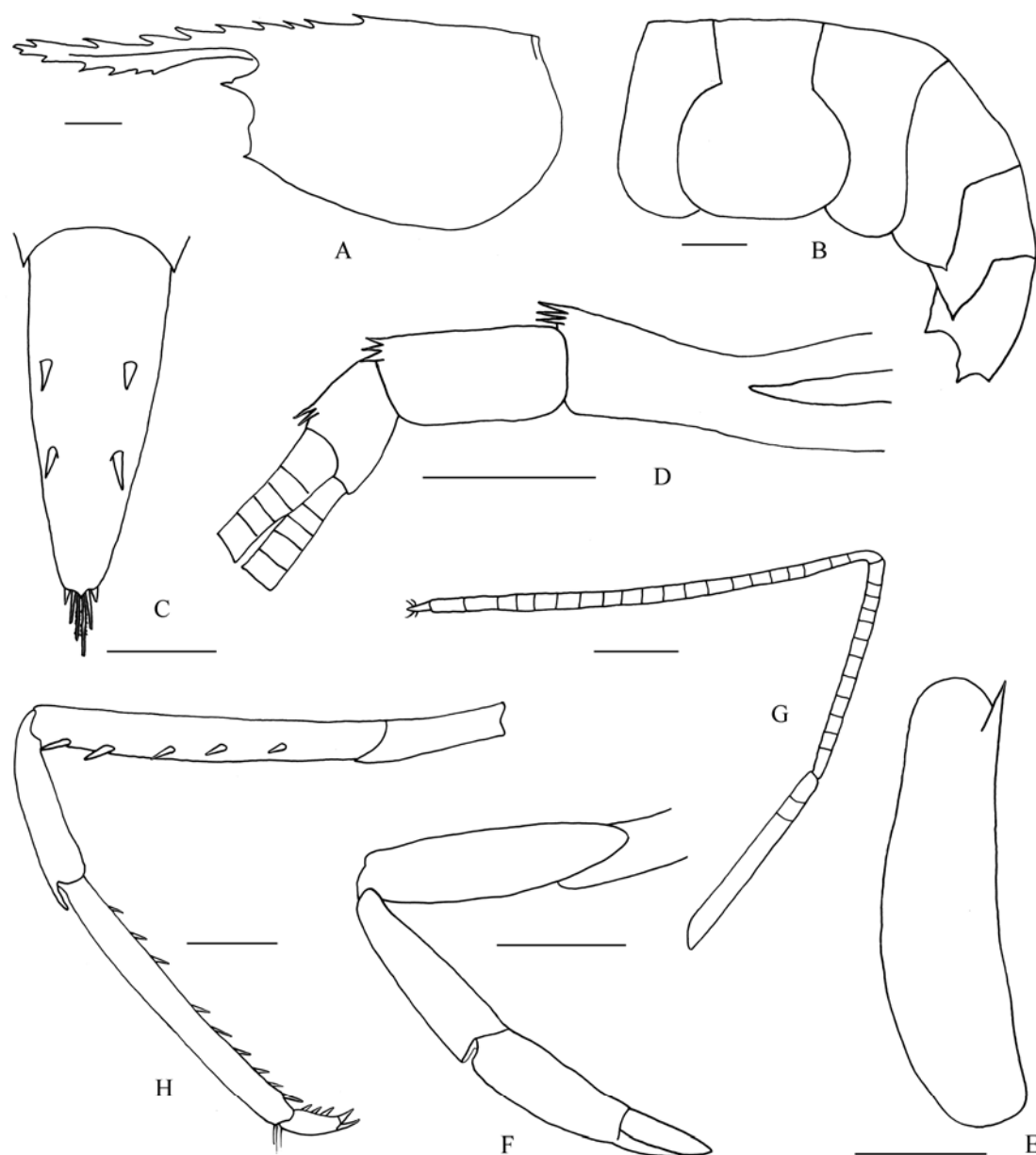


Fig. 14. *Lysmatella prima* Borradaile, 1915. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Telson, dorsal view; D. Antennular peduncle, lateral view; E. Antennal scale, dorsal view; F. First pereopod, lateral view; G. Second pereopod, lateral view; H. Third pereopod, lateral view. Scale bars = 1 mm.

palm; carpus subdivided into 20–24 articles; merus subdivided into 9–12 articles; ischium with 2 articles distally. Third pereopod overreaching distal margin of antennal scale by propodus; biunguiculate dactylus armed with 2–4 accessory spines along entire length of flexor margin; merus with 5–8 distolateral spines. Fourth pereopod overreaching antennal scale by half of propodus; merus with 5–7 distolateral spines. Fifth pereopod overreaching antennal scale by dactylus; merus with 5–7 distolateral spines.

Distribution. South China Sea; Maldives and Andaman Islands, Japan, Philippines, and Indonesia; 0–70 m.

3.2.3 Thoridae Kingsley, 1879 (*sensu* De Grave *et al.*, 2014)

Thoridae Kingsley, 1879: 64. Type genus: *Thor* Kingsley, 1878.

Thoridae Christoffersen, 1987: 350; 1990: 96. (including genera *Birulia* Bražnikov, 1903, *Eualus* Thallwitz, 1892, *Heptacarpus* Holmes, 1900, *Lebbeus* White, 1847, *Paralebbeus* Kemp, 1925, *Spirontocaris* Bate, 1888, *Thor* Kingsley, 1878, *Thorulus* Holthuis, 1947)

Thoridae De Grave *et al.*, 2014: 503. (resurrection)

To date, five genera of the family Thoridae have been found from China seas. They can be distinguished by the following key.

Key to genera of Thoridae from China seas.

1. Third segment of antennular peduncle with subtriangular dorsal scale; reduced rostrum with two or more teeth, adult males with normal first pereopods and second pleopod with appendix masculine..... ***Thor* Kingsley, 1878**
Third segment of antennular peduncle without subtriangular dorsal scale..... 2
2. Carapace without antennal tooth ***Birulia* Bražnikov, 1903**
Carapace with antennal tooth 3
3. Third maxilliped without exopod; second pereopod with 7 carpal articles ***Heptacarpus* Holmes, 1900**
Third maxilliped with exopod 4
4. Carapace with 2–4 supraorbital teeth ***Spirontocaris* Bate, 1888**
Carapace without supraorbital tooth, with branchiostegal margin smooth; sixth abdominal somite without movable plate articulated near posteroventral angle; second pereopod with 7 carpal articles..... ***Eualus* Thallwitz, 1892**

3.2.3.1 *Birulia* Bražnikov, 1903

Birulia Bražnikov, 1903: 44; Urita, 1942: 66; Holthuis, 1947: 42; 1955: 105. Type species: *Birulia sachalinensis* Bražnikov, 1903.

Paraspirontocaris Yokoya, 1930: 535.

Gender. Feminine.

Diagnosis. Integument rigid; Carapace with supraorbital tooth but without antennal tooth; abdominal segments dorsally carinated; third maxilliped with epipod without exopod; carpus of second pereopod subdivided into 7 articles.

Distribution. Yellow Sea; Sea of Japan, Kuril Islands and Okhotsk Sea; 30–100 m.

Remarks. To date, only one species has been found from the China seas.

Birulia kishinouyei (Yokoya, 1930) (Fig. 15)

Paraspirontocaris kishinouyei Yokoya, 1930: 536; Holthuis, 1947: 43. Type locality: Mutsu Bay, Japan.

Birulia kishinouyei Urita, 1942: 67.

Material examined. MBM129571, 1 ♀ (cl 14.33 mm), Chinese coastal water, Yellow Sea, 1976-6-27, st. 1, 78 m, BT, sand, no. OP132B-5, coll. Rui-Yu Liu.

Description. Body rather stout and covered with short hairs. Rostrum projecting obliquely downwards, not only laterally compressed but also provided with rather strong rib on each side and is about 4/5 length of carapace. Carapace carinated in medial line; with very strong supraorbital tooth at base of rostrum on each side, directing forwards and outwards; carapacedilated outwards and forwards to sharp point at branchiostegal angle, but without antennal tooth.

Basal segment of antennular peduncle longer than distal 2 segments combined; stylocerite well-developed, reaching distal margin of second segment of antennular peduncle; second segment with distolateral spine, slightly shorter than third segment, which dorsal margin with sharp spine distally. Antennal scale overreaching apex of rostrum by distal 1/5; 1.7 times as long as wide; distolateral spine falling short of rounded distal margin of lamella. Mandible with molar process, incisor process and 2-segmented palp.

Third maxilliped and anterior 3 pereopods with epipods. Third maxilliped slightly overreaching distal margin of antennal scale, without exopod; ultimate segment flattened, with 7 corneous spines distally. First pereopod stout, reaching near to midpoint of ultimate segment of third maxilliped; dactylus with bifid tip. Second pereopod slender, reaching distal margin of antennal scale; chela small; carpus subdivided into 7 articles, of which proximal third one longest. Ambulatory pereopods similar in structure. Flexor margin of dactylus with 3 spinules excluding terminal claw; propodus with 2 rows of 40–50 spinules along entire length of flexor margin. Merus of third or fourth pereopod armed with 2 distolateral spines; merus of fifth pereopod with only 1 distolateral spine.

First somite dorsally armed with two spinular tubercles in pair on anterior portion, while posterior half dorsally carinated in medial line. Third and fourth somites dorsally strongly carinated in medially, and these carinae more or less

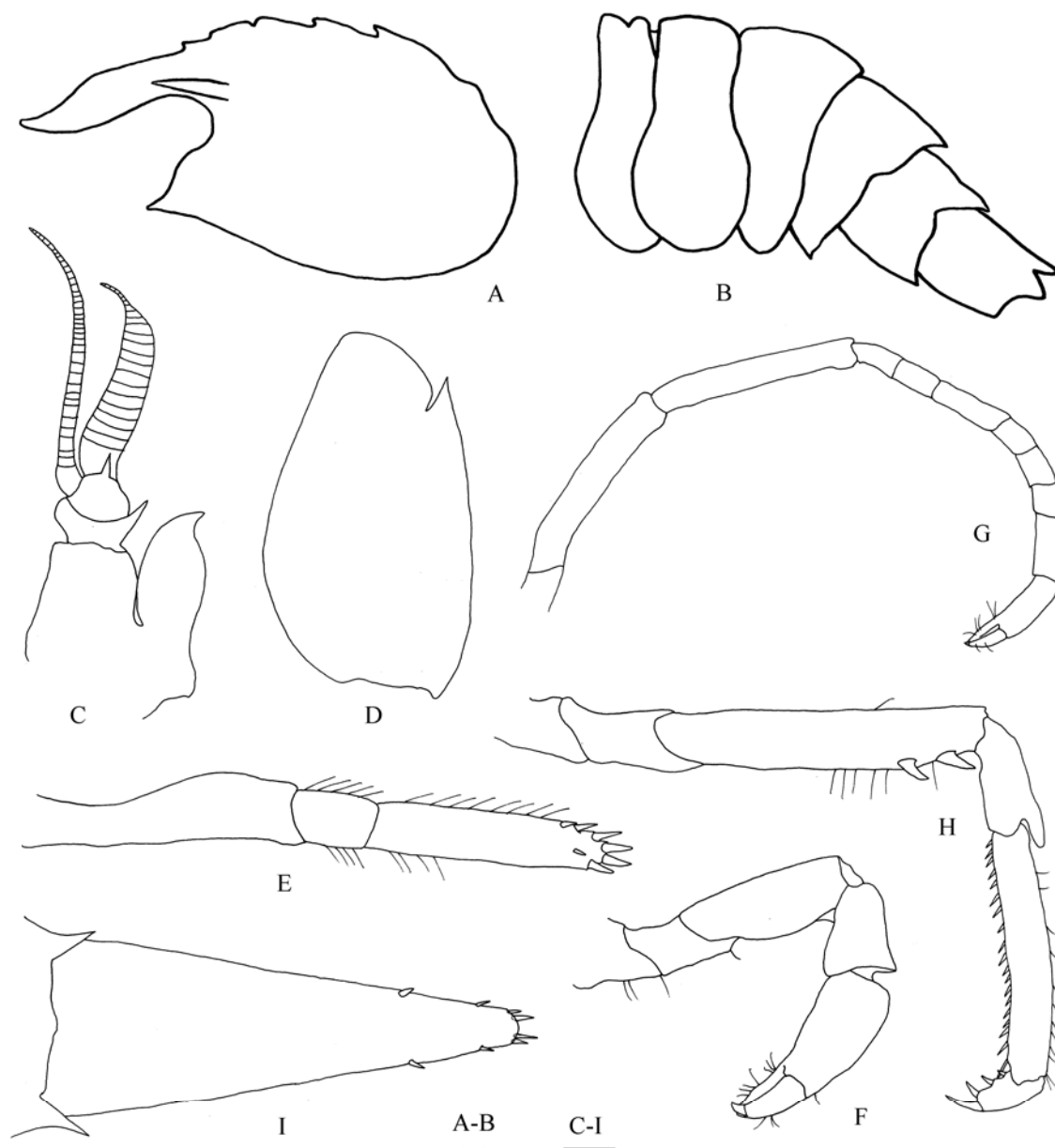


Fig. 15. *Birulia kishinouyei* (Yokoya, 1930). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennule, dorsal view; D. Antennal scale, dorsal view; E. Third maxilliped, lateral view; F. First pereopod, lateral view; G. Second pereopod, lateral view; H. Third pereopod, lateral view; I. Telson, dorsal view. Scale bars = 1 mm.

posteriorly pointed. Anterior half of fifth somite dorsally carinated in medial line, while posterior half dorsally rather flat surfaced, and pair of obtuse carinae extend backwards to two acute points. Sixth somite dorsally rounded, but posteriormargin is produced backwards to an acute point: besides this each side of sixth somite pointed backwards. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Telson longer than preceding two segments combined and exceeding tip of uropod; distal 1/3 of dorsal surface with 2 pairs of spines; posterior margin with 2 pairs of acute spines.

Distribution. Yellow Sea; Northern Gulf of Japan, Sea of Okhotsk; 30–100 m.

3.2.3.2 *Eualus* Thallwitz, 1892

Eualus Thallwitz, 1892: 36. — Hothuis, 1947: 43. Type species: *Eualus obses* Thallwitz, 1892.

Gender. Masculine.

Diagnosis. Carapace without supraorbital spine; eye developed; mandible with molar process, incisor process and two-segmented palp; third maxilliped with exopod and without arthrobranch; carpus of second pereopod subdivided into 7 articles; pereopods without arthrobranches.

Distribution. Worldwide distributed in coast of Indian Ocean, northeast and northwest coasts of Pacific, Northeast Atlantic, Mediterranean, seamount of South Australia and deep-sea around Antarctica.

Remarks. To date, five species of the genus *Eualus* have been found from the China seas. They can be distinguished by the following key.

Key to species of the genus *Eualus* from China seas.

1. Carapace with high keel-like anterior part, dorsal margin with distinct crest at base with 9–12 small dorsal teeth *E. spathulirostris* (Yokoya, 1933)
Carapace without high keel-like anterior part 2
2. First two pairs of pereopods with epipods *E. gracilirostris* (Stimpson, 1860)
First three pairs of pereopods with epipods 3
3. Dorsal margin of rostrum with teeth on proximal half, distal half of dorsal margin of rostrum without any tooth *E. leptognathus* (Stimpson, 1860)
Distal half of dorsal rostral margin with teeth 4
4. Dactylus of ambulatory pereopods with distinct sexual dimorphic, dactyli of third to fifth pereopods with distinct stair-like flexor margins in males; rostrum distinctly exceeding first segment of antennular peduncle in females *E. heterodactylus* Xu & Li, 2014
Dactylus of ambulatory pereopods similar in both males and females; rostrum reaching or slightly falling short of first segment of antennular peduncle in females *E. kikuchii* Miyake & Hayashi, 1967

Eualus gracilirostris (Stimpson, 1860) (Figs 16–17)

Hippolyte gracilirostris Stimpson, 1860: 103. Type locality: Hakodadi.

Spirontocaris gracilirostris Balss, 1914: 44; Yokoya, 1933: 26; Urita, 1942: 27.

Eualus gracilirostris Holthuis, 1947: 11; Miyake & Hayashi, 1967: 255, fig. 4.

Material examined. MBM109868, 1 ♀ (cl 4.51 mm), 1958-5-4, YP2, 49.2 m, mud and gravel, BT; MBM109869, 1 ♂ (cl 2.33 mm), Huiquan cape, 1981-2-18, coll. Xian-Qiu Ren; MBM109870, 1 ♀ (cl 3.95 mm), Hebei, Qinhuang Island, Shanhaiguan, 1974-9-8, coll. Mu Chen; MBM109871, 4 ♂ (cl 2.18–2.63 mm), 3 ♀ (cl 3.11–3.34 mm), Shandong, Qingdao, Daheilan, 1963-11-17, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM109872, 11 ♂ (cl 2.14–3.31 mm), 2 ovig. ♀ (cl 3.65, 3.92 mm), Kaifeng; MBM109873, 1 ♂ (cl 1.47 mm), Shandong, Qingdao, Daheilan, 1964-8-25, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM109874, 8 ♂ (cl 2.63–3.49 mm), 1 ♀ (cl 4.22 mm), Shandong, Weihai, Zhu Island, 1953-11-5; MBM109875, 6 ♂ (cl 2.32–3.29 mm), 11 ♀ (cl 3.58–4.43 mm), Shandong, Qingdao, Daheilan, 1964-2-28, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM109877, 7 ♂ (cl 2.23–3.88 mm), 9 ♀ (cl 3.72–4.39 mm), Shandong, Qingdao, Daheilan, 1957-2-14, coll. Feng-Xuan Zhang & En-Ze Yang; MBM109880, 3 ♀ (cl 4.03–4.57 mm), 1954-6-20; MBM109882, 7 ♂ (cl 2.21–2.80 mm), 1 ♀ (cl 3.32 mm), 1 ovig. ♀ (cl 3.17 mm), Shandong, Yantai, Kongtong Island, 1957-7-2, coll. Jie-Shan Xu; MBM109886, 6 ♂ (cl 2.96–3.80 mm), Yellow Sea, 1958-3-24; MBM109888, 6 ♂ (cl 2.16–2.59 mm), Shandong, Qingdao, Daheilan, 1963-9-19; MBM109889, 4 ♂ (cl 3.19–3.36 mm), 3 ♀ (cl 3.57–3.91 mm), Shandong, Longkou, Furong Island, 1956-2-12; MBM109930, 3 ♀ (cl 4.31–4.46 mm), 1 ovig. ♀ (cl 4.07 mm), Shandong, Qingdao, west coast of Tuandao, 1951-3-9; MBM109892, 9 ♀ (cl 3.85–4.67 mm), Shandong, Qingdao, Mai Island, 1951-12-22;

MBM109895, 3 ♀ (cl 4.30–4.61 mm), Shandong, Qingdao Aquarium, 1955-2-10; MBM109896, 1 ♂ (cl 3.40 mm), Huangdao, 1955-10-31, coll. Jie-Shan Xu; MBM109897, 4 ♂ (cl 2.00–2.36 mm), 1 ♀ (cl 2.46 mm), Shandong, Qingdao, Daheilan, 1963-10-21, coll. Zhen-Gang Fan, Jie-Shan Xu, Xiu-Bin Fang & Mu Chen; MBM109898, 3 ovig. ♀ (cl 2.52–2.79 mm), Shandong, Yantai, Dongshan, 1957-6-27, coll. Jie-Shan Xu; MBM109899, 1 ♂ (cl 3.36 mm), Shandong, Qingdao, Daheilan, 1963-6-21, coll. Zhen-Gang Fan, Jie-Shan Xu, Xiu-Bin Fang & Mu Chen; MBM109900, 3 ♂ (cl 2.87–2.99 mm), 7 ovig. ♀ (cl 3.46–4.29 mm), Shandong, Qingdao, Daheilan, 1963-5-21, coll. Bin Fan; MBM109901, 1 ♀ (cl 4.41 mm), 3 ovig. ♀ (cl 3.69–4.26 mm), Shandong, Qingdao, Shilaoren, 1956-4-10, coll. Zhen-Gang Fan & Yong-Liang Wang; MBM109903, 1 ♂ (cl 3.44 mm), Shandong, Qingdao, Shilaoren, 1957-1-4, coll. Jie-Shan Xu; MBM109904, 1 ♀ (cl 4.38 mm), Shandong, Qingdao, Guizhou Road, 1955-3-19; MBM109905, 5 ♂ (cl 2.34–2.87 mm), 2 ♀ (cl 2.95, 3.21 mm), Shandong, Qingdao, Taiping Cape, 1981-11-14; MBM129718, 17 ♂ (cl 2.19–3.82 mm), 3 ♀ (cl 3.59–4.19 mm), Shandong, Qingdao, Mai Island, 1954-11-13.

Description. Rostrum slender, dorsal margin with 6 teeth, of which posterior one situated on carapace; ventral margin armed with 2–4 subterminal teeth. Rostrum reaching distal margin of antennular peduncle in female, not reaching distal margin of second segment of antennular peduncle in male. Carapace longer than rostrum, with antennal tooth moderately strong; pterygostomial tooth present or not.

Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth; telson about 1.5 times longer than sixth abdominal somite; dorsal surface with 4 pairs of dorsolateral spines. Apex of telson acutely pointed, with 2 pairs of spines and 1 mesial pair of stiff setulose setae.

Eye moderate; stalk longer than cornea.

Antennular peduncle reaching midpoint of antennal scale; three segments of antennular peduncle each with small spine on its distal margin; stylocerite of female specimen reaching midpoint of second segment of antennal peduncle, but that of male rather shorter, reaching almost to distal margin of first segment of antennular peduncle. Antennal scale broad, 2 times as long as wide. Third maxilliped exceeding antennal scale by 1/4 length of ultimate segment in female, reaching tip of antennal scale in male; with both of exopod and epipod.

First pereopod short and robust, with epipod; reaching distal margin of antennular peduncle. Second pereopod slender, with epipod; carpus subdivided into 7 articles. Following 3 pereopods subequal in features and without epipods. Merus of

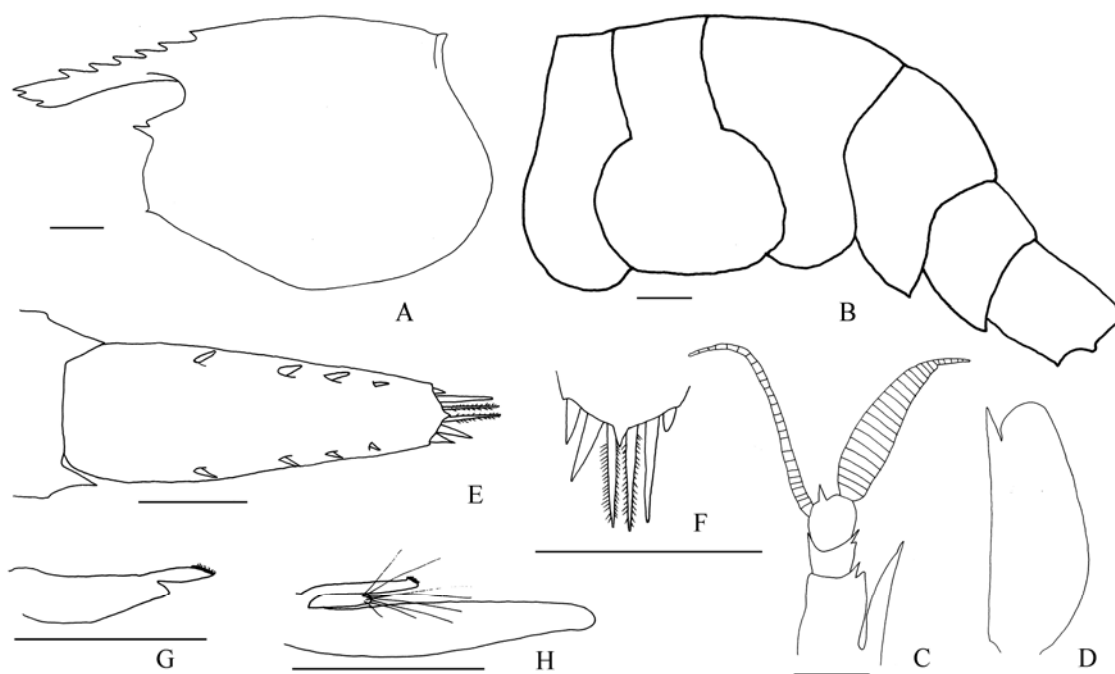


Fig. 16. *Eualus gracilirostris* (Stimpson, 1860). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennular peduncle, dorsal view; D. Antennal scale, dorsal view; E. Telson, dorsal view; F. Apex of telson, dorsal view; G. Endopod of first pleopod of male, ventral view; H. Endopod of second pleopod of male, ventral view. Scale bars = 1 mm.

third pereopod armed with 2–5 distolateral spines; dactylus of third pereopod armed with 4 or 5 spinules in female and 6 or 7 in male.

Appendix interna of female expanded in distal part and bearing many coupling hooks; appendix masculine of male large and short, being half length of appendix interna with truncated tip which bearing eight long hairs.

Coloration in life. Body pale brown and yellowish green. Carapace with some red brown transverse lines. Abdominal somites with one red brown transverse line on first somite and two similar lines on both second and third somites. Tail fan with broad dark brown transverse band. Antennal flagellum light orange. Third maxilliped and following five pereopods with some greenish-brown bands. Eggs dull green.

Distribution. Northern China waters; Sea of Japan; often in rocky intertidal beach; 0–60 m.

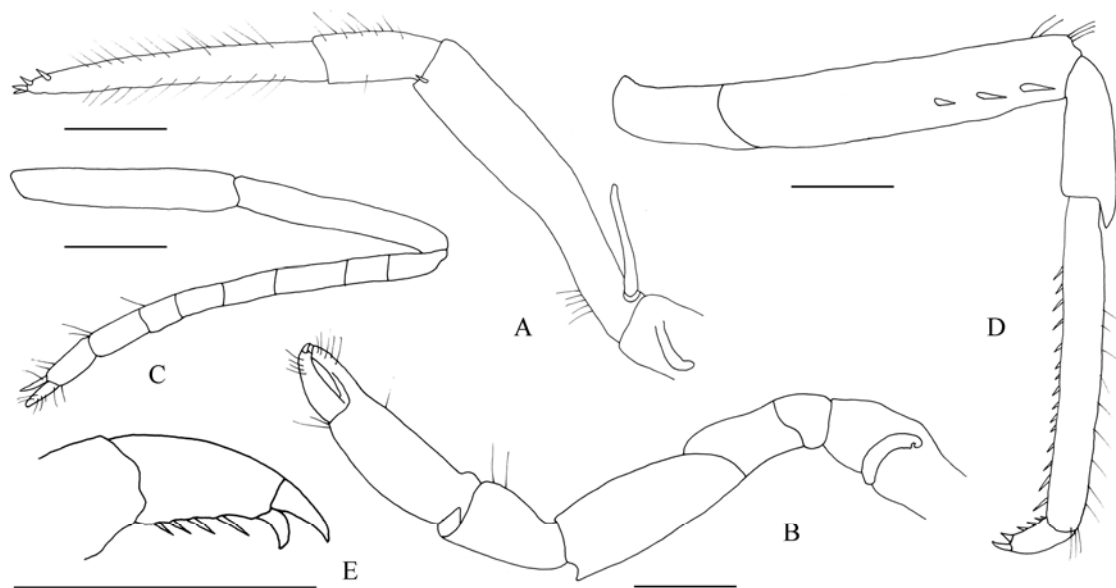


Fig. 17. *Eualus gracilirostris* (Stimpson, 1860). A. Third maxilliped, lateral view; B. First pereopod, lateral view; C. Second pereopod, lateral view; D. Third pereopod, lateral view; E. Dactylus of third pereopod, lateral view. Scale bars = 1 mm.

***Eualus heterodactylus* Xu & Li, 2014** (Figs 18–20)

Eualus heterodactylus Xu & Li, 2014a: 1339. Type locality: Yellow Sea.

Material examined. MBM109929, 1 ♂ (cl 2.20 mm), Chinese coastal water, Yellow Sea, 1957-7-26, st. Y207, 47.5 m, sandy mud, BT, no. VIII 1B-17, coll. Rui-Yu Liu; MBM109927, 11 ovig. ♀ (cl 1.86–3.17 mm), 10 ♂ (cl 1.61–2.95 mm), Chinese coastal water, Yellow Sea, 1957-7-26, st. Y108, 47.5 m, sand, no. VI5B-28, coll. Rui-Yu Liu; MBM109933, 1 ovig. ♀ (cl 2.90 mm), Chinese coastal water, Yellow Sea, 1957-10-2, st. Y205, 51.1 m, sandy mud and crushed shells, BT, no. VIX3B-24, coll. Rui-Yu Liu; MBM109928, 3 ovig. ♀ (cl 3.00–3.09 mm), Chinese coastal water, Yellow Sea, 1957-7-12, st. P401, 52 m, sandy mud, BT, no. VII1B-34, coll. Rui-Yu Liu.

Description. Male. Integument moderately thin, smooth. Rostrum 0.7–0.8 length of carapace, nearly straight, slightly descending, reaching cornea and not exceeding basal segment of antennular peduncle; dorsal margin with 5–7 teeth, posterior-most one on carapace posterior to orbital margin; distal quarter unarmed; ventral margin armed with one or two small sub-terminal tooth; lateral carina not conspicuous. Carapace with well-developed antennal tooth and minute pterygostomian tooth; anterolateral margin between antennal and pterygostomian tooth sinuous.

Abdomen rounded dorsally. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Sixth somite 1.7 times as long as fifth. Telson about 1.4 times as long as sixth abdominal somite; dorsal surface with four pairs of dorsolateral spines and three pairs of terminal spines, lateral pair similar to dorsolateral series; posterior margin of telson terminates in small acute tooth.

Eye subpyriform; cornea with indistinct ocellar spot, shorter than stalk.

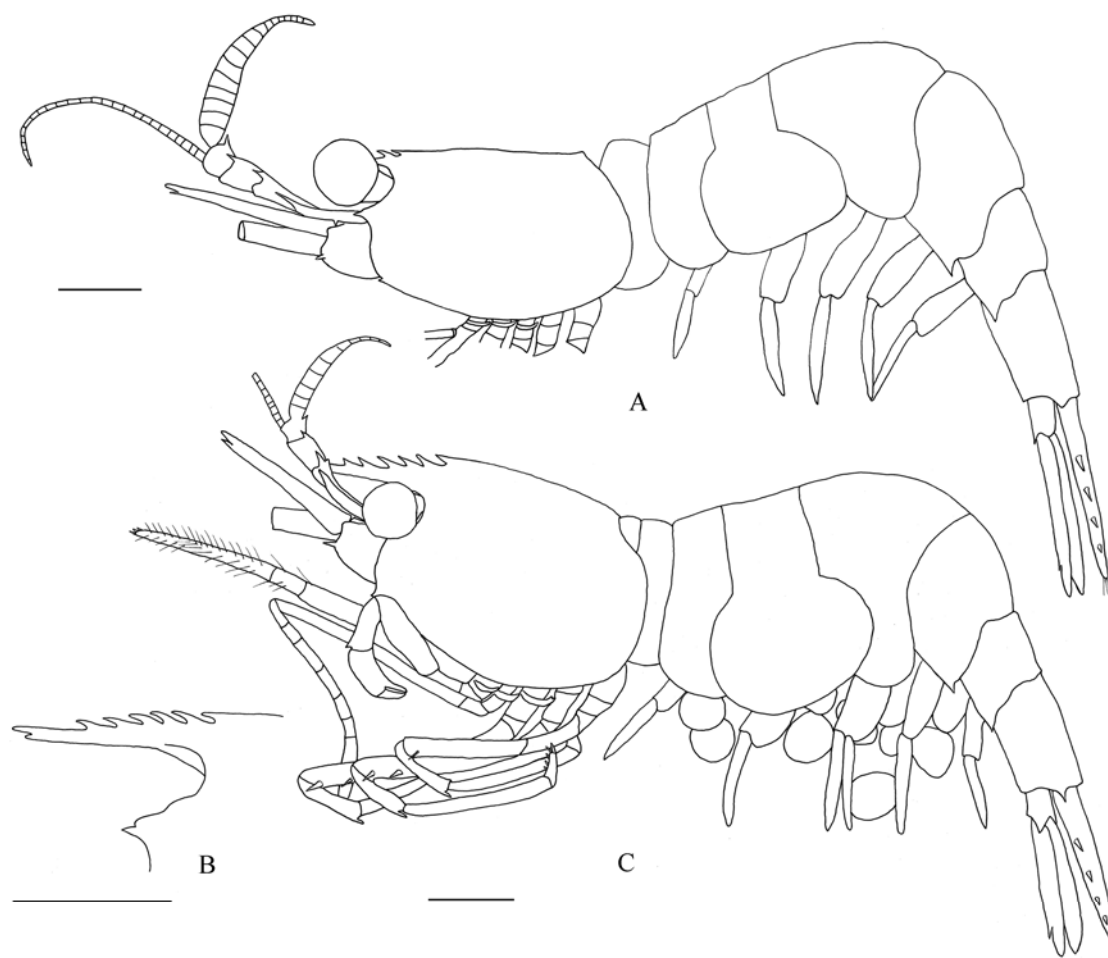


Fig. 18. *Eualus heterodactylus* Xu & Li, 2014 (After Xu & Li, 2014a). A. Male, whole body, lateral view; B. Male, rostrum, lateral view; C. Female, whole body, lateral view. Scale bars = 1 mm.

Antennular peduncle reaching distal 0.2 of antennal scale. Basal segment reaching nearly to midlength of antennal scale, with prominent distolateral tooth and strong subdistal, ventromesial tooth; stylocerite 0.7–0.8 length of basal segment (exclusive of dorsolateral tooth), terminating in acute point. Distal two segments combined are 0.7 times length of basal segment, each with distinct spiniform distal tooth. Outer flagellum with 10–12 thickened segments, slightly shorter than length of carapace. Inner flagellum slender, elongate, about 1.4 times length of outer flagellum, with 28–33 segments.

Antennal peduncle with basicerite bearing strong ventrolateral distal tooth, distodorsal angle bluntly produced. Carpocerite reaching midlength of antennal scale. Antennal scale subequal in length to carapace, 3.2 times as long as wide. Lateral margin faintly concave, with distolateral tooth slightly shorter or just reaching rounded distal margin of blade.

Mouthparts typical of genus. Mandible with two-segmented palp; incisor process slender, with series of five subequal, tiny, distal teeth; molar process stout.

Third maxilliped moderately long and slender, reaching beyond or overreaching antennal scale; ultimate segment 2.9 times as long as penultimate segment, with 4–6 corneous spines distally; antepenultimate segment subequal in length to distal two segments combined, distoventral margin with small spine. Exopod exceeds middle of antepenultimate segment; epipod present.

First to third pereopods with strap-like, terminally hooked epipods.

First pereopod moderately stout, falling short of distal margin of antennal scale. Chela about 1.8 times as long as carpus, 4.1 times as wide; dactylus with bifid tip, slightly less than half length of palm; palm subcylindrical, 2.6 times as long as wide, fixed finger terminating in single corneous claw. Carpus slightly more than twice as long as wide. Merus 4.2

times as long as wide.

Second pereopod overreaching antennal scale by 0.4 length of carpus; carpus with seven articles, third proximal article longest. Merus tentimes as long as wide.

Third pereopod moderately long and slender, overreaching antennal scale by about half of propodus; dactylus 0.2–0.3 times as long as propodus, about 2.5 times as long as high, armed with six accessory spines along entire length of stair-like flexor margin (excluding terminal claw), each spine with strongly protruding base. Propodus 11 times as long as wide; flexor margin with about 40 spinules in two rows, spinules increasing in size distally. Carpus about half length of propodus, 4.2–6.3 times as long as wide. Merus 5.6 times as long as wide, with 2–4 lateral spines distally. Ischium about 0.3 length of merus, unarmed, not widened distally.

Fourth and fifth pereopod similar to third pereopod, former overreaching antennal scale by 0.4 length of propodus, merus with 2–3 lateral spines distally; latter with merus armed with one or two distolateral spines.

First pleopod with endopod elongate subtriangular, with some setae on lateral margin; appendix interna terminal, elongate, about half length of endopod. Second pleopod with appendix masculina moderately stout, about 3.0 times as long as wide, about 0.6 length of appendix interna and bearing seven long stiff setae.

Female. Body stout. Rostrum exceeding basal segment of antennular peduncle, not reaching distal margin of third segment of antennular peduncle; ventral margin armed with two small subterminal teeth. Stylocerite reaching distal margin of first segment of antennular peduncle. Dactylus of ambulatory pereopods biunguiculate, armed with three or four accessory spines along entire length of flexor margin, bases not protruded. Merus of third and fourth pereopods armed with

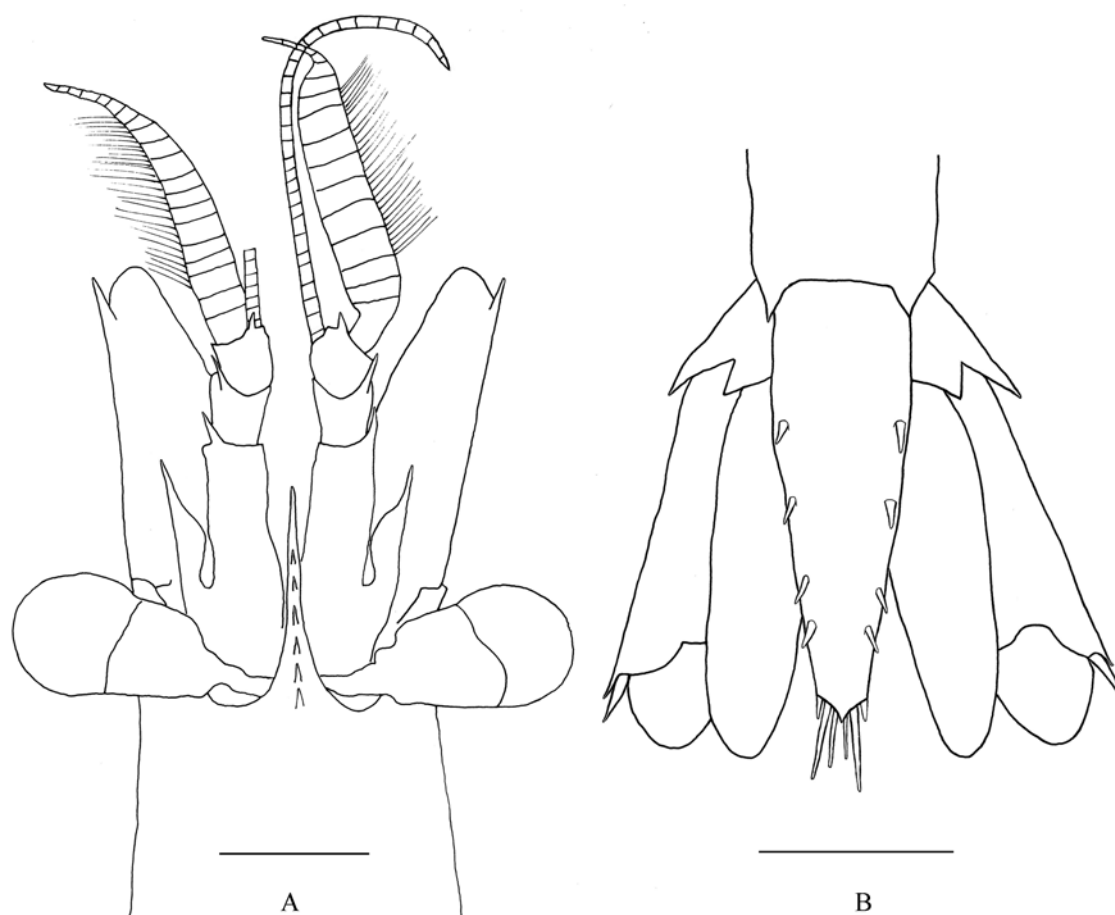


Fig. 19. *Eualus heterodactylus* Xu & Li, 2014, male (After Xu & Li, 2014a). A. Anterior part of carapace and cephalic appendages, dorsal view (marginal setae of antennal scale omitted); B. Telson and uropod, dorsal view (marginal setae omitted). Scale bars = 1 mm.

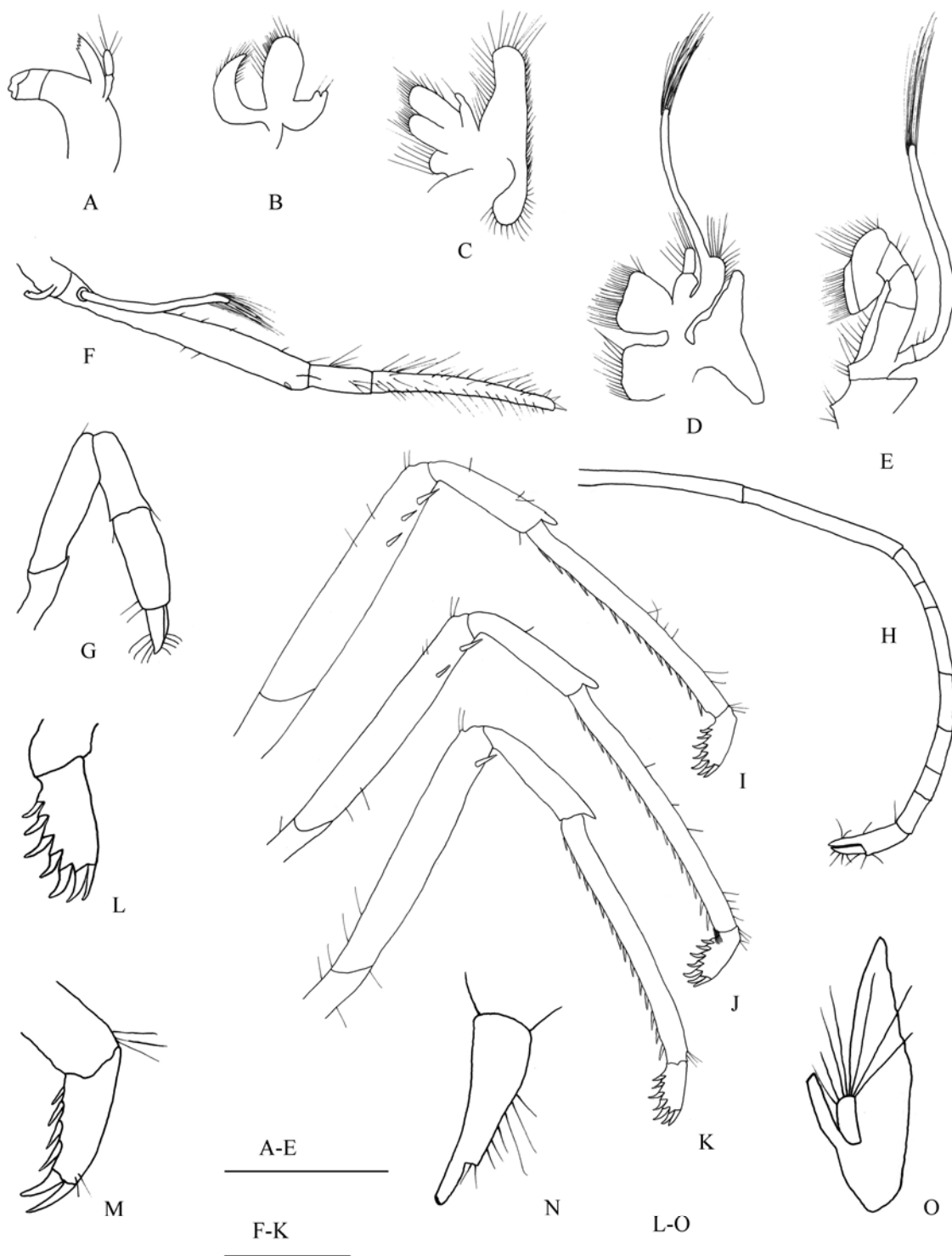


Fig. 20. *Eualus heterodactylus* Xu & Li, 2014 (After Xu & Li, 2014a). A–N. Male. A. Left mandible, external view; B. Left maxillule, external view; C. Left maxilla, external view; D. Left first maxilliped, external view; E. Left second maxilliped, external view; F. Right third maxilliped, lateral view; G. First pereopod, lateral view; H. Second pereopod, lateral view; I. Third pereopod, lateral view; J. Fourth pereopod, lateral view; K. Fifth pereopod, lateral view; L. Dactylus of third pereopod, lateral view; M. Endopod of first pleopod, ventral view (setae partially omitted); N. Endopod of second pleopod, ventral view (setae partially omitted). O. Female, dactylus of third pereopod, lateral view. Scale bars = 1 mm.

2–4 distolateral spines. Merus of fifth pereopod armed with one distolateral spine. Dorsal surface of telson with 4 or 5 pairs of dorsolateral spines.

Coloration in life. Unknown.

Distribution. Only known from type locality Yellow Sea at depths of 30–50 m.

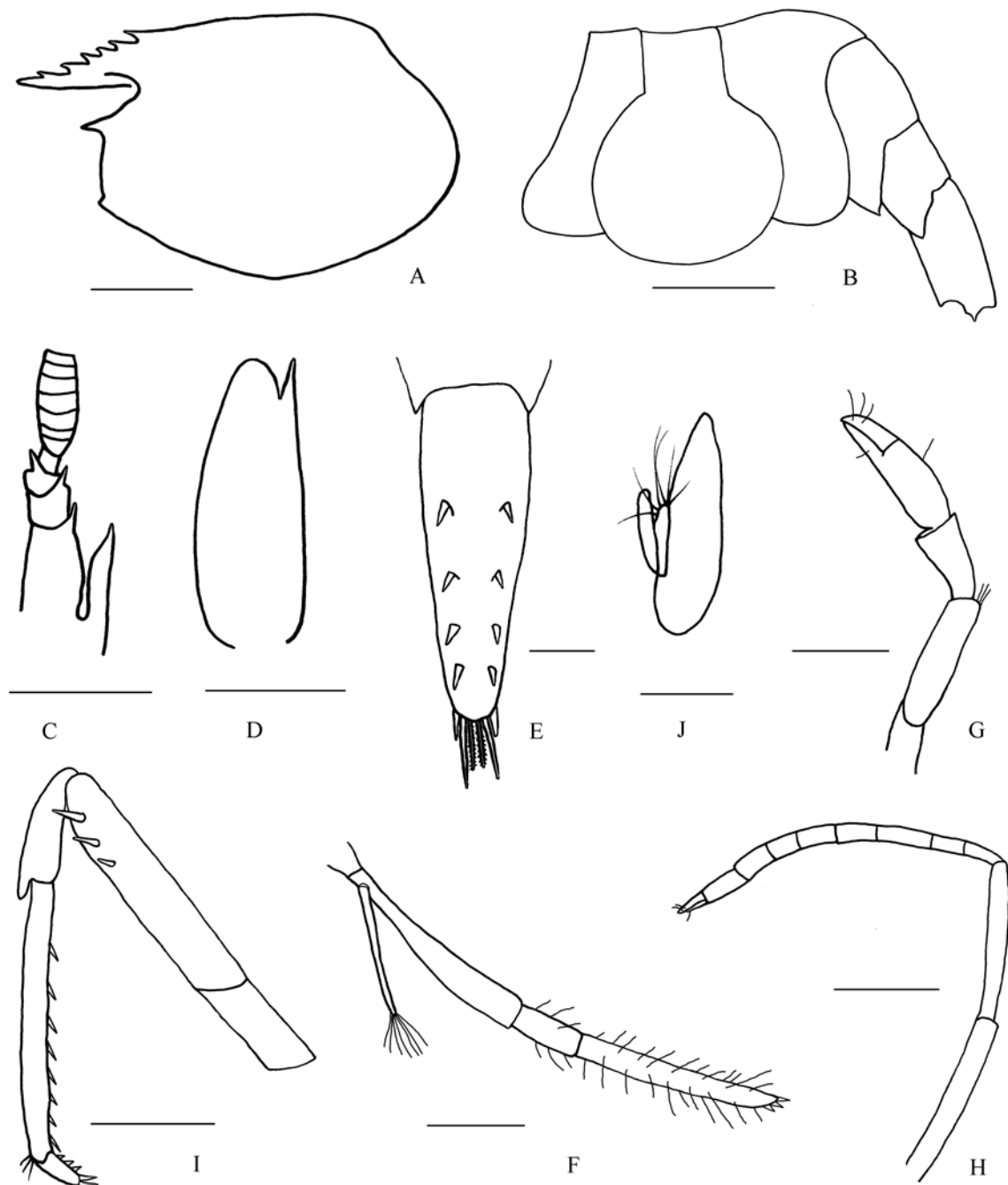


Fig. 21. *Eualus kikuchii* Miyake & Hayashi, 1967. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennular peduncle, dorsal view; D. Antennal scale, dorsal view; E. Telson, dorsal view; F. Third maxilliped, lateral view; G. First pereopod, lateral view; H. Second pereopod, lateral view; I. Third pereopod, lateral view; J. Endopod of second pleopod, ventral view (setae partially omitted). Scale bars = 1 mm.

***Eualus kikuchii* Miyake & Hayashi, 1967** (Fig. 21)

Eualus kikuchii Miyake & Hayashi, 1967: 261, figs 6–7; Hayashi & Miyake, 1968: 129, fig. 4; Noël, 1978: 32 (key); Chace, 1997: 43 (list); Komai & Fujiwara, 2012: 74, figs. 6–8. Type locality: Tomioka Bay, Amakusa Island.

Eualus bulychae Miyake, 1982: 184 (part; list); Komai & Hayashi, 2002: 390 (list).

Material examined. MBM109926, 2 ♀ (cl 1.31–2.67 mm), 2 ovig. ♀ (cl 1.87–2.43 mm), 1958-10-23, st. 1098, 55 m, no. V64B-5; MBM109931, 6 ♂ (cl 1.26–1.94 mm), 3 ♀ (cl 1.50–2.39 mm), 8 ovig. ♀ (cl 1.67–3.19 mm), 1957-7-12, st. P401, 52 m, sandy mud, BT, no. VII1B-34, coll. Rui-Yu Liu; MBM109932, 4 ovig. ♀ (cl 3.05–3.43 mm), Yellow Sea, 1958-4-9, st. PY207, 45 m, mud with shell fragment, BT, no. VXIV63B-10.

Description. Rostrum about half length of carapace, nearly straight, slightly descending, reaching or slightly falling short of basal segment of antennular peduncle; dorsal margin with 4–6 teeth, posteriormost one on carapace slightly posterior to margin of orbit; ventral margin unarmed or armed with only one subterminal tooth. Carapace with antennal tooth moderately strong; pterygostomial tooth present or not in males.

Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Sixth somite 1.6 times as long as fifth mid-dorsal length. Telson about 1.4 times longer than sixth abdominal somite; dorsal surface with four or five pairs of dorsolateral spines; posterior margin with two pairs of spines and one mesial pair of stiff setulose setae.

Eye subpyriform; cornea with distinct ocellar spot. Antennular peduncle reaching distal 0.4 of antennal scale. Basal segment with strong distolateral tooth reaching nearly to midlength of antennal scale; distal two segments combined much shorter than basal segment, each with distinct spiniform distal tooth. Sharp stylocerite reaching distal margin of basal segment. Antennal scale about 4/5 length of carapace, 2.6 times as long as wide; lateral margin nearly straight, with distolateral tooth reaching rounded distal margin of blade.

Mandible with two-segmented palp, slender incisor process and stout molar process. Third maxilliped moderately long and slender, overreaching antennal scale by 1/3 length of ultimate segment; ultimate segment with 6–8 corneous spines distally; exopod exceeds middle of antepenultimate segment; epipod present.

First to third pereopods with strap-like, terminally hooked epipods.

First pereopod reaching nearly midlength of antennal scale. Chela about 1.5 times longer than carpus; dactylus about 0.6 times longer than palm; merus about 1.7 times longer than carpus. Second pereopod overreaching antennal scale by chela and half of carpus; carpus with seven sub-segments.

Third to fifth pereopods with similar structure.

Third pereopod overreaching antennal scale by length of dactylus and 2/5 of capus; dactylus less than 1/3 times as long as propodus, armed with 4–6 accessory spines along entire length of flexor margin (excluding terminal claw); propodus with row of spinules on flexor margin; carpus about half length of propodus; merus with 2–4 prominent lateral spines distally. Merus of fourth pereopod with 1–3 lateral spines distally; merus of fifth pereopod unarmed or with only one distolateral spine.

In males, endopod of first pleopod with appendix interna elongate subtriangular; endopod of second pleopod with appendix masculina slightly shorter than appendix interna.

Coloration in life. Body and appendages generally translucent.

Distribution. Yellow Sea; Pacific side of mainland Japan, from Sagami Sea to Amakusa, Kyushu, 40–230 m.

Remarks. This species was not previously recorded from the China seas.

***Eualus leptognathus* (Stimpson, 1860)** (Fig. 22)

Hippolyte leptognatha Stimpson, 1860: 103. Type locality: Hokkaido.

Spirontocaris japonica Yokoya, 1930: 273, 533.

Spirontocaris leptognatha Yokoya, 1933: 26.

Eualus leptognathus Holthuis, 1947: 11, 43; Miyake & Hayashi, 1967: 258, fig. 5.

Material examined. MBM109912, 1 ♂ (cl 2.34 mm), Shandong, Yantai, Kongtong Island, 1933-12-13; MBM109913, 1 ovig. ♀ (cl 4.27 mm), Shandong, Qingdao, Zhonggang, 1955-2-27; MBM109915, 3 ovig. ♀ (cl 4.04–4.33 mm), 2 ♂ (cl 3.22, 3.56 mm), Shandong, Qingdao, Guizhou Road, 1955-3-19; MBM109916, 2 ♀ (cl 3.76, 4.19 mm), 3 ♂ (cl 3.71–4.05 mm), Shandong, Qingdao, Zhonggang, 1956-2-4, coll. Feng-Xuan Zhang; MBM109917, 3 ♂ (cl 2.15–3.01 mm), Shandong, Qingdao, Fish Farm, 1955-11-18, coll. Feng-Xuan Zhang; MBM129738, 1 ovig. ♀ (cl 3.94 mm), 5 ♀ (cl 4.07–4.35 mm), 3 ♂ (cl 3.43–3.62 mm), Shandong, Qingdao, Guizhou Road, 1955-3-19; MBM109921, juvenile (cl

0.76–0.91 mm), Shandong, Qingdao, Yumingzhui, 1955-9-20; MBM109922, 2 ♂ (cl 3.37, 3.92 mm), Shandong, Yantai Port, Zhifu, 1954-5-18; MBM109923, 1 ♀ (cl 3.92 mm), juvenile (cl 0.63–1.16 mm), Shandong, Qingdao, Zhonggang, 1955-7-14.



Fig. 22. *Eualus leptognathus* (Stimpson, 1860), carapace, lateral view. Scale bar = 1 mm.

Description. Rostrum longer than carapace, laterally compressed, apically upward; dorsal margin with 3–6 teeth on proximal half, and distal half of ventral margin armed with 2–5 teeth in front of foremost tooth on dorsal margin. Antennal spines acutely pointed, setting below obtuse suborbital angle and pterygostomial spine small but distinct.

Pleura of fourth somite unarmed posteriorly but that of fifth with small posteroventral tooth. Telson about 1.3 times as long as sixth abdominal somite, with 4 or 5 pairs of dorsal spines; posteriormargin of telson terminates in small acute tooth with 2 pairs of spines and one mesial pair of stiff setulose setae.

Eye rather large; stalk longer than cornea.

Stylocerite is sharp, reaching distal margin of antennular peduncle; 3 segments of antennular peduncle each with distinct spiniform distal tooth. Antennal scale broad, 5 times as long as wide, slightly overreaching apex of rostrum; lateral margin straight, distolateral tooth falling short of rounded distal margin of blade. Third maxilliped with exopod and epipod, reaching distal margin of antennal scale.

First to third pereopods with strap-like, terminally hooked epipods.

First pereopod stout and short, reaching distal margin of antennular peduncle. Second pereopod slender, reaching or overreaching distal margin of antennal scale. Biunguiculate dactylus of third pereopod armed with 6 or 7 accessory spines along entire length of flexor margin; merus with 4–7 prominent lateral spines distally. Merus of fourth pereopod with 4 or 5 lateral spines distally; fifth pereopod reaching distal tip of stylocerite, merus with 3 or 4 distolateral spines.

Appendix interna of female expanded in distal part bearing many coupling hooks; appendix masculine of male large and short, being 1/3 length of appendix interna with truncated tip bearing eleven long hairs.

Coloration in life. Body generally translucent with some small brown spots; eggs are brown green.

Distribution. Northern China seas; Sea of Japan; shallow water or clear seaweed pond, like attaching to objects.

Eualus spathulirostris (Yokoya, 1933) (Fig. 23)

Spirontocaris spathulirostris Yokoya, 1933: 28; Holthuis, 1947: 23. Type locality: Tsugaru Strait.

Eualus spathulirostris Miyake & Hayashi, 1968: 367.

Material examined. MBM109934, 11 ♂ (cl 4.21–5.36 mm), 5 ♀ (cl 3.61–5.31 mm), 10 ovig. ♀ (cl 4.62–5.97 mm), Yellow Sea, 1958-5-4, 49.2 m, mud, gravel and shell fragment, BT; MBM109936, 1 ♂ (cl 2.60 mm), Yellow Sea, 1992-9-13, 77 m, fine sand, AT; MBM109937, 6 ♂ (cl 3.97–4.52 mm), 5 ♀ (cl 4.01–5.45 mm), 1957-3-14; MBM109940, 2 ♂ (cl 2.69, 3.24 mm), 1 ovig. ♀ (cl 4.70 mm), Yellow Sea, 1958-4-16, 52.8 m, mud, BT; MBM109942, 2 ♀ (cl 4.03, 4.29 mm), Yellow Sea, 1957-11-14, 55 m, BT, coll. Rui-Yu Liu; MBM109943, 3 ♂ (cl 3.68–4.52 mm), 5 ♀ (cl 4.07–5.66 mm), 1 ovig. ♀ (cl 4.24 mm), Northern Yellow Sea, 1959-1-22, sandy mud, 55 m, BT, coll. Yu-Heng Cui; MBM109945, 2 ♂ (cl 3.28, 3.80 mm), 3 ovig. ♀ (cl 3.45–3.91 mm), Yellow Sea, 1962-3-5, 54 m, sandy mud, AT, coll. Feng-Shan Xu; MBM109952, 8 ♂ (cl 3.58–4.32 mm), 4 ♀ (cl 4.23–4.75 mm), Yellow Sea, 1957-11-15, 51 m, fine sand, BT, coll. Rui-Yu Liu; MBM109954, 1 ♀ (cl 5.04 mm), East China Sea, 1976-7-22, 70 m, fine sand, AT, coll. Zhi-Can Tang; MBM109955, 2 ♂ (cl 4.13, 5.33 mm), Yellow Sea, 1992-9-14, mud, 26 m, coll. Feng-Shan Xu; MBM109956, 3 ♂ (cl 3.82–4.41 mm), Yellow Sea, 1958-4-15, 60.4 m, mud, BT; MBM109958, 5 ♂ (cl 3.69–4.42 mm), Yellow Sea, 1957-11-15, 54 m, mud, BT, coll. Rui-Yu Liu; MBM109959, 4 ♂ (cl 3.87–5.30 mm), 3 ovig. ♀ (cl 4.18–4.70 mm), 1958-6-21; MBM109961, 4 ♂ (cl

4.34–5.46 mm), 10 ovig. ♀ (cl 5.23–6.59 mm), Yellow Sea, 1958-7-9; MBM109962, 1 ♀ (cl 5.29 mm), 3 ovig. ♀ (cl 4.02–4.27 mm), Yellow Sea, 1957-7-29, 52 m mud, BT, coll. Rui-Yu Liu; MBM109963, 11 ovig. ♀ (cl 5.63–6.98 mm), Yellow Sea, 1992-5-21, 61 m, fine sand, AT, coll. Feng-Shan Xu; MBM109964, 2 ♂ (cl 3.10, 3.78 mm), 3 ♀ (cl 4.17–4.53 mm), Yellow Sea, 1957-11-14, 57 m, mud, BT, coll. Rui-Yu Liu; MBM109965, 4 ♂ (cl 2.56–4.13 mm), Yellow Sea, 1957-11-16, 46 m, mud and sand, BT, coll. Rui-Yu Liu; MBM109966, 6 ♂ (cl 3.31–4.65 mm), 1957-8-4, 26 m, BT, coll. Rui-Yu Liu; MBM109967, 1 ♂ (cl 2.57 mm), 1 ovig. ♀ (cl 3.91 mm), Yellow Sea, 1957-7-28, 47.5 m, BT, coll. Rui-Yu Liu; MBM109969, 2 ovig. ♀ (cl 3.59, 4.42 mm), Yellow Sea, 1992-5-23, 47.5 m, sandy mud, AT, coll. Feng-Shan Xu; MBM109970, 3 ♀ (cl 4.88–5.17 mm), Yellow Sea, 1958-7-9, 55.6 m, mud, AT; MBM109973, 1 ovig. ♀ (cl 4.92 mm), Yellow Sea, 1992-9-12, 48 m, mud, AT, coll. Feng-Shan Xu; MBM109979, 3 ♂ (cl 3.99–4.47 mm), 2 ♀ (cl 4.22, 4.54 mm), 2 ovig. ♀ (cl 4.71, 4.76 mm), Yellow Sea, 1957-7-26, 47.5 m, sandy mud, BT, coll. Rui-Yu Liu; MBM109981, 3 ♂ (cl 5.16–5.31 mm), Yellow Sea, 1992-9-12, 72 m, mud, AT, coll. Feng-Shan Xu; MBM109982, 5 ♂ (cl 3.86–4.97 mm), 4 ♀ (cl 4.56–4.78 mm), 6 ovig. ♀ (cl 4.38–4.61 mm), Yellow Sea, 1957-10-28, 50 m, coll. Rui-Yu Liu; MBM109983, 2 ovig. ♀ (cl 5.09, 5.34 mm), Yellow Sea, 1992-5-23, 21 m, mud, AT, coll. Rui-Yu Liu; MBM057600, 1 ♂ (cl 2.83 mm), Yellow Sea, 1959-7-21, 54 m, brown mud, BT, coll. Gong-Yi Hu; MBM057713, 1 ♂ (cl 4.25 mm), Yellow Sea, 1959-10-29, 55.8 m, brown mud, BT, coll. Gong-Yi Hu.

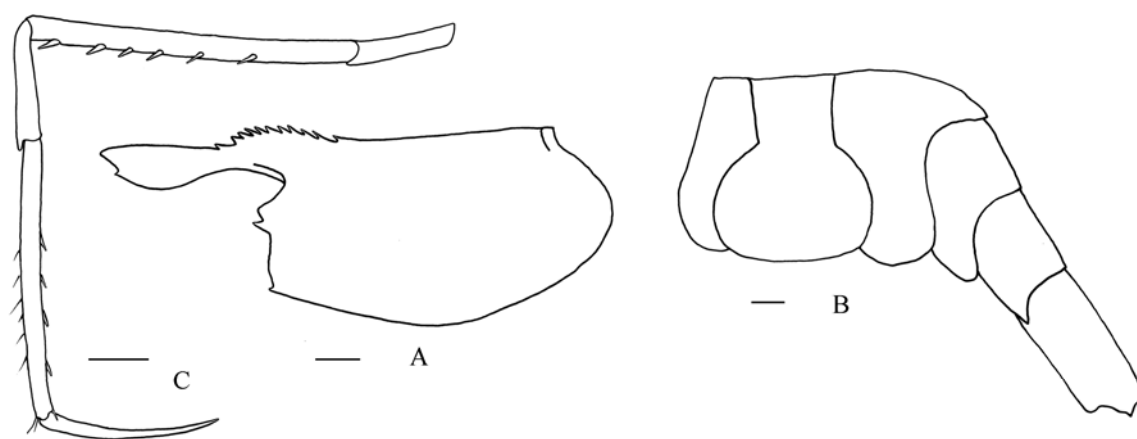


Fig. 23. *Eualus spathulirostris* (Yokoya, 1933). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Third pereopod, lateral view. Scale bars = 1 mm.

Description. Carapace anteriorly with high keel which is thin and continuous with proximal part of rostrum. There are 9 to 12 small teeth on keel. Rostrum reaching distal end of antennular peduncle. No tooth on distal half of dorsal margin. Ventral margin somewhat dilated distally, bearing 1 or 2 teeth on dilated portion. Antennal spine well-developed, pterygostomian tooth small but conspicuous.

Abdomen rounded dorsally. Pleurae of first four somites broadly rounded. Pleura of fifth somite with sharp posteroventral tooth. Sixth somite twice as long as fifth. Telson slightly longer than sixth abdominal somite, with 3 pairs of dorsolateral spines and 3 pairs of terminal spines.

Eye large and globular; cornea much broader than stalk.

Basal segment of antennular peduncle longer than distal two segments combined. Stylocerite reaching distal end of basal segment. Second segment rather long, twice as long as third, with marginal spine on outer side. Third segment with small marginal spine on top of segment. Upper antennular flagellum thickened and setose in proximal 11–14 segments. Antennal scale slender, about 4.5 times as long as wide; lateral margin straight, ending in sharp spine. Mouthparts typical of genus. Mandible with two-segmented palp; incisor process slender, with series of 4 subequal, tiny, distal teeth; molar process stout.

Third maxilliped reaching distal margin of antennal scale; ultimate segment almost 3 times as long as penultimate; antepenultimate segment rather long, about 1.5 times as long as ultimate; exopod short, reaching proximal 1/4 or 1/3 of antepenultimate segment.

First pereopod reaching distal end of antennular peduncle; merus about 1.5 times as long as carpus; carpus slender, subequal or slightly shorter than narrow chela. Second pereopod slender, exceeding antennal scale by length of chela; merus andischium subequal in length; carpus with 7 articles, third proximal article longest. Third pereopod moderately long and slender; merus 2.5 times as long as carpus, with 6 to 8 lateral spines along outer surface; propodus twice as long as carpus, with 9 spines on flexor margin; extensor margin with a few plumose hairs.

Dactylus like strongly curved nail, about more than half of propodus, without any spine on flexor margin. Fourth pereopod overreaching antennal scale by dactylus; merus armed with 6 or 7 spines on outer surface; dactylus slender, about half of propodus. Fifth pereopod reaching distal margin of antennal scale; with 6 or 7 spines on outer surface of merus.

Endopod of first pleopod of male very small, bearing appendix interna with a few retinacula placed near tip of endopod. Appendix masculina of second pleopod furnished with several strong setae, being 1/3 as long as appendix interna. Appendix interna of female armed with many retinacula on distal half.

Distribution. Yellow Sea, East China Sea; northern Japanese waters; 20–80 m.

3.2.3.3 *Heptacarpus* Holmes, 1900

Heptacarpus Holmes, 1900: 195; Holthuis, 1947: 43; 1955: 102; Hayashi & Miyake, 1968: 131; Hayashi, 1979: 11. Type species: *Hippolyte palpator* Owen, 1839.

Gender. Masculine.

Diagnosis. Rostrum long, slender with upper and lower teeth. Supraorbital spine absent, antennal spine present, pterygostomial spine present or absent. Abdomen smooth, pleurae of first three somites rounded, fourth pointed or rounded, fifth usually pointed. Merus of last three pereopods with row of several outer spines. Mandible consisting of incisor process and two-jointed palp. Telson with 3–7 pairs of dorsal spines. Carpus of second pereopod with seven articles.

Distribution. Bohai Gulf, Yellow Sea, East China Sea; Sea of Japan; 3–80 m.

Remarks. To date, six species of the genus *Heptacarpus* have been certainly reported from the China seas, including a new recorded species. They can be distinguished by the following key.

Key to species of the genus *Heptacarpus* from China.

1. Pereopods without epipods 2
First three pairs of pereopods with epipods 4
2. Rostral lateral carina sharp *H. acuticarinatus* Komai & Ivanov, 2008
Rostral lateral carina blunt 3
3. Tergite of third abdominal somite strongly elevated in posterior part, making abdomen noticeably gibbous
..... *H. geniculatus* (Stimpson, 1860)
Tergite of third abdominal somite only slightly convex *H. pandaloides* (Stimpson, 1860)
4. Merus of first pereopod with subterminal spine *H. rectirostris* (Stimpson, 1860)
Merus of first pair of pereopods unarmed 5
5. Body large; rostrum shorter than carapace *H. futilirostris* (Bate, 1888)
Body small; rostrum as long as or longer than carapace *H. commensalis* Hayashi, 1979

Heptacarpus acuticarinatus Komai & Ivanov, 2008 (Fig. 24)

Spirontocaris camtschatica Balss, 1914: 44; Parisi, 1919: 47; Yokoya, 1933: 26. Not *Spirontocaris camtschatica* (Stimpson, 1860).

Heptacarpus camtschaticus: Hayashi & Miyake, 1968: 134; Hayashi, 1979: 14; 1992: 180; Liu & Zhong, 1994: 559. Not *Heptacarpus camtschaticus* (Stimpson, 1860).

Heptacarpus acuticarinatus Komai & Ivanov, 2008: 9. Type locality: Sagami Bay.

Material examined. MBM109774, 4 ♂ (cl 3.36–4.59 mm), 1 ovig. ♀ (cl 4.75 mm), 1958-5-4, 49.2 m, mud, gravel and shell fragment, BT; MBM109775, 2 ♂ (cl 3.34–3.87 mm), 3 ♀ (cl 4.96–5.59 mm), 1 ovig. ♀ (cl 5.22 mm), Yellow Sea, 1958-4-9, 45 m, mud and shell fragment, BT; MBM109778, 7 ♂ (cl 3.98–4.86 mm), 5 ♀ (cl 4.81–5.52 mm), Yellow Sea, 1958-7-6, st. Y1, sand and gravel, AT; MBM109779, 1 ♂ (cl 5.32 mm), 1 ovig. ♀ (cl 5.69 mm), Yellow Sea, 1958-7-6, st. Y206, 51.5 m, mud and sand, AT; MBM109782, 2 ovig. ♀ (cl 4.19, 4.25 mm), brown sandy mud, BT; MBM109783, 2 ♂ (cl 2.93, 3.27 mm), 1 ♀ (cl 4.20 mm), 1958-4-11, st. Y106, 50.8 m, mud, BT; MBM109785, 1 ♂ (cl 4.47 mm), 1 ♀ (cl 4.61 mm), Yellow Sea, 1958-7-9, st. Y407; MBM109786, 1 ♀ (cl 5.22 mm), Yellow Sea, 1957-7-1, st. Y106, 49 m, mud, BT,

coll. Rui-Yu Liu; MBM109787, 1 ♂ (cl 3.17 mm), 1957-7-12, st. P403, 21 m, sandy mud, BT, coll. Rui-Yu Liu; MBM109788, 11 ♂ (cl 3.27–4.75 mm), 12 ovig. ♀ (cl 3.49–5.61 mm), 1958-4-9, st. Y207, coll. Zhi-Can Tang; MBM109789, 2 ♀ (cl 4.75, 5.21 mm), Yellow Sea, 1957-11-13, st. Y302, 53.3 m, mud, BT, coll. Rui-Yu Liu; MBM109790, 1 ♂ (cl 2.66 mm), 1957-8-2, st. P204, 26 m, sandy mud, BT, coll. Rui-Yu Liu; MBM109791, 1 ♂ (cl 4.02 mm), 1958-5-4, st. YP1, 53 m, sandy mud, gravel and shell fragment, BT; MBM109792, 15 ♂ (cl 3.15–4.26 mm), 2 ovig. ♀ (cl 4.17, 5.06 mm), Yellow Sea, 1957-10-25, st. Y1, 51.5 m, sandy mud, roch and shell fragment, BT, coll. Rui-Yu Liu; MBM109793, 10 ♂ (cl 3.18–3.93 mm), 1 ♀ (cl 4.86 mm), 4 ovig. ♀ (cl 3.54–5.60 mm), Yellow Sea, 1958-4-11, st. Y107, 50 m, mud and sand, BT; MBM109794, 1 ♀ (cl 4.28 mm), Yellow Sea, 1958-7-9, st. Y406, 55.6 m, mud, AT; MBM109795, 1 ♂ (cl 4.11 mm), 1 ovig. ♀ (cl 4.79 mm), Southern Yellow Sea, 1975-4-18, 65 m, mud, BT; MBM109796, 1 ♀ (cl 5.17 mm), Yellow Sea, 1957-10-2, st. Y205, 51.5 m, sandy mud, BT, coll. Rui-Yu Liu; MBM109797, 1 ♀ (cl 4.96 mm), Yellow Sea, 1958-7-7, st. Y302, 57.5 m, mud, AT, coll. Rui-Yu Liu; MBM109799, 2 ♂ (cl 3.29, 3.31 mm), 3 ovig. ♀ (cl 4.57–4.93 mm), Yellow Sea, 1957-11-15, st. Y605, 51 m, fine sand, BT, coll. Rui-Yu Liu; MBM109800, 1 ♂ (cl 2.86 mm), Yellow Sea, 1958-6-17, st. Y103, mud, BT; MBM109801, 3 ♂ (cl 2.13–2.87 mm), 1 ♀ (cl 3.43 mm), 1957-7-12, st. P401, 52 m, sandy mud, BT, coll. Rui-Yu Liu; MBM109803, 23 ♂ (cl 3.61–4.59 mm), 8 ♂ (cl 3.21–4.43 mm), 3 ovig. ♀ (cl 3.86–4.76 mm), Yellow Sea, 1957-10-3, st. Y206, 54 m, BT, coll. Rui-Yu Liu; MBM129685, 3 ♂ (cl 2.65–3.17 mm), 2 ♀ (cl 4.59, 4.76 mm), 1957-11-14, st. Y506, 35 m; MBM109820, 12 ♂ (cl 3.34–4.70 mm), 5 ♀ (cl 4.59–5.22 mm), Yellow Sea, 1959-10-30, 52 m, mud, coll. Hui-Lian Chen.

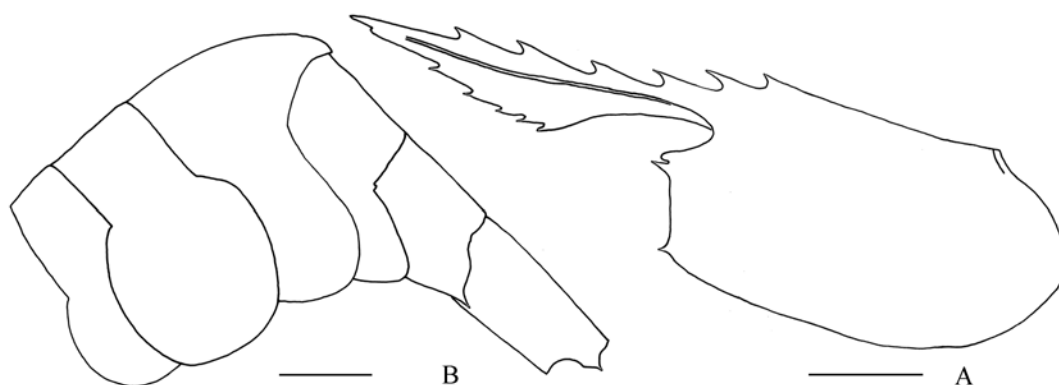


Fig. 24. *Heptacarpus acuticarinatus* Komai & Ivanov, 2008. A. Carapace, lateral view; B. Abdominal pleurae, lateral view. Scale bars = 1 mm.

Description. Rostrum straight, slightly falling short of or reaching distal margin of antennal scale, 1.3 length of carapace; dorsal margin armed with 5–7 teeth including 1 or 2 on carapace, distal 1/5 of dorsal margin unarmed; ventral margin with 5–8 teeth (teeth slightly unequal or subequal in size except for minute distal most tooth); lateral carina sharply defined. Carapace with suborbital lobe rounded, constricted at base, falling short of or reaching antennal tooth; pterygostomial angle always with small tooth.

Abdomen dorsally rounded, not gibbous. Second somite with faint transverse groove on tergite. Pleurae of anterior four somites broadly rounded; fifth pleuron with moderately large posteroventral tooth, posterolateral margin sinuous. Sixth somite 1.5 times longer than fifth and 2.0 times longer than high. Telson 1.2 times as long as sixth somite, about 3.5 times longer than wide, armed with 5 or 6 dorsolateral spines on either side; posterior margin terminating in acute tooth, with 3 pairs of unequal spines.

Eye-stalk generally subpyriform; cornea slightly wider and longer than remaining part of eyestalk; ocellus distinct, showing as black spot; maximal diameter of cornea 0.2 of carapace length. Antennular peduncle not reaching midlength of antennal scale. First segment unarmed on dorso distal margin; stylocerite overreaching distal margin of first segment, closely in touch with first segment; second segment about 0.3 length of first segment, with small spine at dorsolateral distal angle; third segment short, with small spine on dorsodistal margin. Lateral flagellum with thickened aesthetasc-bearing portion 1/3 length of carapace. Antennal scale slightly longer than carapace and 3.5 times longer than wide; lateral margin straight; distal lamella exceeding beyond distolateral tooth.

Third maxilliped reaching distal 1/4 of antennal scale; ultimate segment with seven darkly pigmented corneous spines

distally. First pereopod reaching nearly to midlength of antennal scale; chela about 1.9 of carpal length; merus about 1.7 of carpal length. Second pereopods reaching distalmargin of antennal scale; dactylus 0.7 of palm length; carpus about 3.8 times longer than chela, divided in 7 unequal articles; ischium subequal in length to merus.

Third to fifth pereopods similar in structure. Third pereopod slightly overreaching distal margin of antennal scale; biunguiculate dactylus about 0.3 of propodal length, armed with 4 or 5 accessory spinules on flexor margin; propodus with 2 rows of slender spinules on flexor margin; carpus about half length of propodus; merus armed with 7–10 lateral spines. Fourth pereopod reaching about distal 0.7 of antennal scale; merus with 5–8 lateral spines. Fifth pereopod reaching midlength of antennal scale; merus with 3–6 lateral spines.

Endopod of first pleopod elongate subtriangular, with conspicuous appendix interna at terminal position; second pleopod with appendix masculina slightly shorter than appendix interna.

Coloration in life. Body and appendages generally pale pink; cornea gray.

Distribution. Yellow Sea; Southern Hokkaido to Kyushu, Japan and Korea, 30–150 m.

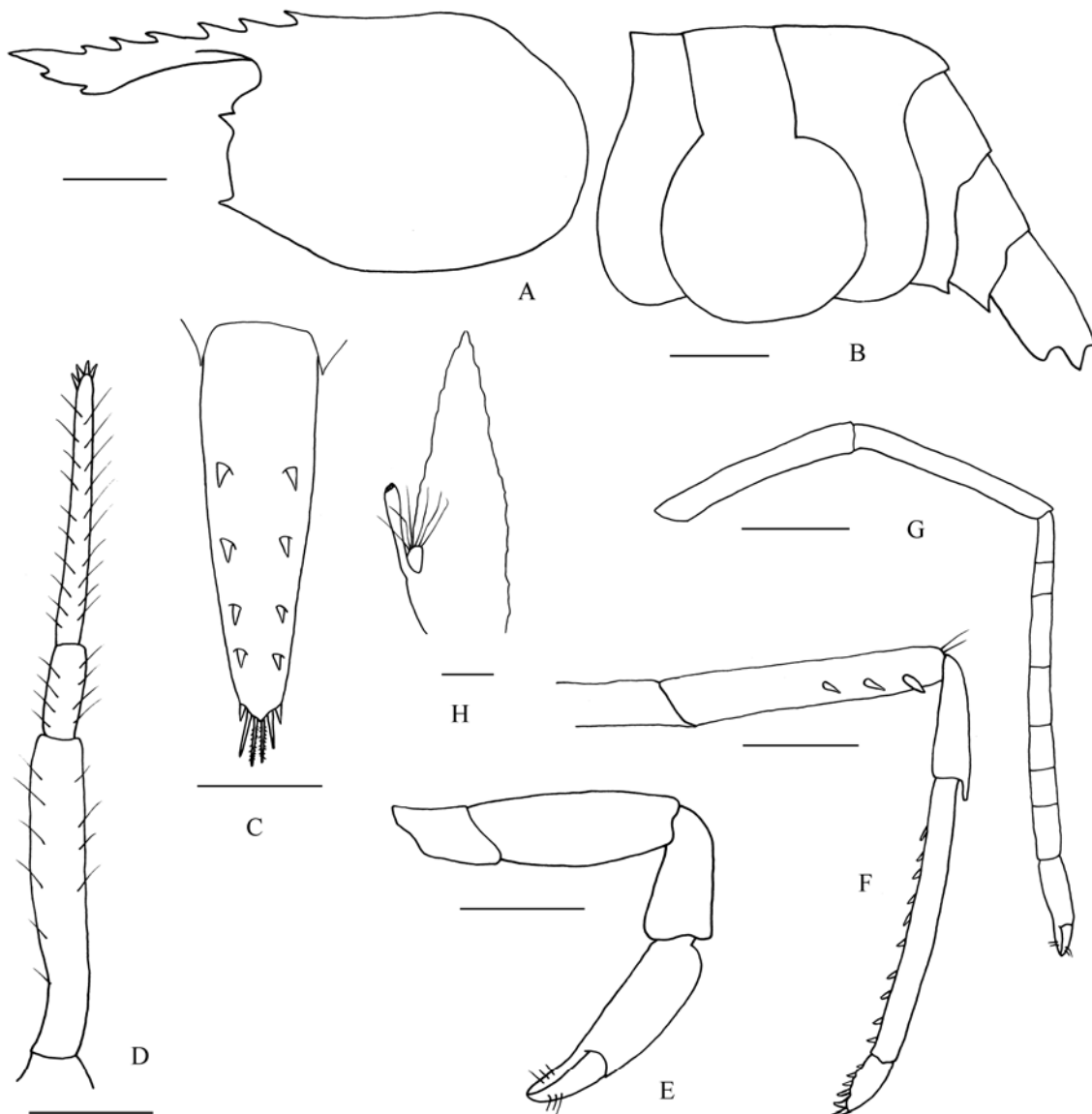


Fig. 25. *Heptacarpus commensalis* Hayashi, 1979. A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Telson, dorsal view; D. Third maxilliped, lateral view; E. First pereopod, lateral view; F. Second pereopod, lateral view; G. Third pereopod, lateral view; H. Second endopod in male, lateral view. Scale bars = 1 mm.

***Heptacarpus commensalis* Hayashi, 1979** (Fig. 25)

Heptacarpus commensalis Hayashi, 1979: 14. Type locality: Shirahama.

Material examined. MBM129660, 1 ♀ (cl 2.93 mm), Shandong, Qingdao, Jiaozhou Bay, 1964-8-4, st. K033, 45 m, sand and shell fragment, AT, no. M133A-7; MBM129663, 7 ♂ (cl 1.73–2.38 mm), 13 ovig. ♀ (cl 2.65–3.86 mm), 10 ♀ (cl 2.41–3.73 mm), Shandong, Qingdao, Shazikou, 1955-7-9, no. 55-01015; MBM129683, 1 ♂ (cl 2.16 mm), Shandong, Qingdao, Shazikou, 1952-3-18, no. 57-210, coll. En-Ze Yang.

Description. Small shrimps about 3.5 mm rostral length in ovigerous females and males slightly smaller than females. Rostrum straight, as long as or slightly longer than carapace, with 5–6 teeth on dorsal margin, of which posterior two teeth present on carapace and two teeth on ventral margin near apex. Carapace smooth, with well-developed antennal and pterygostomial spines in females but with well-developed antennal spine and pterygostomial angle armed or unarmed in males. Abdomen smooth, third somite not strongly geniculate. Pleurae of fourth and fifth somites ending in sharp tooth. Telson 1.2–1.3 times as long as sixth somite with 4 pairs of dorsal spines; posterior margin pointed at middle, armed with 3 pairs of spines. Eye comparatively large, with distinct ocellus.

Antennular peduncle reaching nearly torostral apex, each segment with small marginal spine. Stylocerite reaching distal margin of first segment. Antennal scale broad, exceeding beyond rostrum by distal half. Outer terminal spine exceeding lamellar part. Epipods on third maxilliped and first three pereopods. Third maxilliped reaching beyond antennal scale by distal half of ultimate segment. First pereopod robust, reaching distal margin of antennal scale, merus without subterminal spine. Second pereopod slender, exceeding antennal scale by chela and distal half of carpus; carpus subdivided into 7 articles.

Third pereopod overreaching antennal scale by dactylus and half propodus. Dactylus short with 6 teeth on flexor margin, propodus slender, about 4 times as long as dactylus, with 11 teeth on flexor margin. Merus with 3 or 4 teeth on distal outer surface. Following two pereopods resemble third one in structure. Fourth pereopod overreaching antennal scale by dactylus. Fifth pereopod just reaching distal margin of antennal scale. Dactylus and propodus of these two pereopods slightly shorter than those of third pereopod but with similar structure, but with tuft of hairs on outer distal end of fifth propodus. Merus of fourth pereopod with 2 or 3 spines on distal outer surface near distal articulation, that of fifth pereopod with single subterminal spine.

Endopod of first pleopod with some retinaculae near apex and with about 10 shortplumose setae on inner margin. Appendix masculina of second endopod in males very short, with about 10 setae on top.

Distribution. Chinese coast of Yellow Sea; northern gulf of Japan; 10–70 m.

Remarks. This species was not previously recorded from the China seas.

***Heptacarpus futilirostris* (Bate, 1888)** (Fig. 26)

Nauticaris futilirostris Bate, 1888: 606. Type locality: Akashi Strait.

Spirontocaris rectirostris De Man, 1906: 403; 1907: 411; Kemp, 1916: 386; Urita, 1921: 217; 1926: 426; Nakazawa & Kubo, 1947: 776.

Heptacarpus rectirostris Liu, 1955: 36.

Heptacarpus futilirostris Miyake & Hayashi, 1968: 437.

Material examined. MBM129636, 4 ♂ (cl 5.71–7.10 mm), 1 ovig. ♀ (cl 3.61 mm), 1936-5-4; MBM129637, 1 ♀ (cl 3.51 mm); MBM129638, 1 ♀ (cl 3.98 mm), Shandong, Qingdao, Cangkou, 1951-2-23; MBM129639, 1 ovig. ♀ (cl 4.55 mm), Shandong, Qingdao, Shazikou, 1963-4-11, coll. Zhen-Gang Fan, Mu Chen & Xiu-Bin Fang; MBM129640, 2 ♀ (cl 3.03, 3.58 mm), Shandong, Qingdao, Long Island, 1954-5-3; MBM129642, 1 ♂ (cl 6.36 mm), Shandong, Qingdao, Zhonggang, 1955-12-5, coll. Bao-Lin Zhang; MBM129644, 11 ovig. ♀ (cl 3.64–4.41 mm), Shandong, Qingdao, Shazikou, 1956-3-31; MBM129645, 2 ♀ (cl 3.73, 4.79 mm), 1964-4-22, 24 m, mud and sand, AT, coll. Feng-Shan Xu; MBM129647, 2 ♂ (cl 4.75, 5.61 mm), 3 ovig. ♀ (cl 4.33–4.62 mm), Shandong, Qingdao, Shazikou, 1957-4-16, coll. Feng-Xuan Zhang; MBM129650, 1 ♀ (cl 3.87 mm), Shandong, Qingdao, Shazikou, fish farm, 1955-12-9, coll. Feng-Xuan Zhang; MBM129651, 3 ovig. ♀ (cl 3.43–4.92 mm), 1964-4-21, 6 m, AT, coll. Feng-Shan Xu; MBM129652, 5 ♂ (cl 3.14–3.65 mm), 2 ♀ (cl 2.99, 3.86 mm), 1952-10-16; MBM129653, 1 ♀ (cl 2.96 mm), 1957-6-18; MBM129658, 1 ♂ (cl 6.26 mm), 2 ♀ (cl 4.26, 4.91 mm), 1954-6-2; MBM129659, 10 ovig. ♀ (cl 3.60–5.98 mm), Shandong, Qingdao, Guizhou Road, 1955-4-23; MBM129662, 2 ovig. ♀ (cl 4.70, 5.56 mm), Shandong, Qingdao, fish farm, 1954-6-18; MBM129664, 2 ♂ (cl 5.19, 5.80 mm), Shandong, Qingdao, Shazikou, 1957-3-7, coll. Feng-Xuan Zhang & En-Ze Yang; MBM129691, 1 ♀ (cl 4.47 mm), Shandong, Qingdao, Cangkou, 1956-11-5, coll. Feng-Xuan Zhang; MBM129692, 1 ♂ (cl 5.15 mm), 5 ♀ (cl

3.69–4.20 mm), Shandong, Qingdao, Shazikou, 1957-2-5, coll. Feng-Xuan Zhang & En-Ze Yang; MBM129693, 1 ♂ (cl 5.72 mm), Shandong, Yantai, first bathing beach, 1936-3-18; MBM129694, 2 ♂ (cl 4.67, 5.33 mm), 2 ♀ (cl 5.19, 6.25 mm), Shandong, Qingdao, Shilaoren, 1957-1-4, coll. Feng-Xuan Zhang; MBM129695, 1 ♂ (cl 4.21 mm), Shandong, Qingdao, Zhan Bridge, 1954-11-1; MBM129698, 4 ♂ (cl 6.09–6.74 mm), 9 ♀ (cl 3.35–4.56 mm), Shandong, Qingdao, fish farm, 1956-12-19, coll. Han-Zeng Sun; MBM129699, 4 ♂ (cl 2.90–3.37 mm), 3 ♀ (cl 3.41–3.67 mm), Shandong, Qingdao, fish farm, 1954-9-18; MBM129701, 2 ♀ (cl 3.51, 3.65 mm), Shandong, Qingdao, Zhan Bridge, 1955-10-18, coll. Jie-Shan Xu; MBM129702, 4 ♀ (cl 3.65–4.34 mm), 1 ovig. ♀ (cl 5.41 mm), Shandong, Qingdao, Guizhou Road, 1955-3-18; MBM129703, 2 ovig. ♀ (cl 4.20, 4.37 mm), Shandong, Qingdao, Guizhou Road, 1954-4-20; MBM129704, 4 ♂ (cl 5.59–6.41 mm), Shandong, Qingdao, Daheilan, 1957-2-14, coll. Feng-Xuan Zhang & En-Ze Yang; MBM129706, 1 ♂ (cl 6.08 mm), Huiquan Bay, 1981-2-18, coll. Xian-Qiu Ren; MBM129707, 3 ovig. ♀ (cl 4.86–5.82 mm), Fujian, Pingtan, Dongwo, 1957-3-16, coll. Rui-Yu Liu; MBM129711, 2 ♂ (cl 4.92, 5.34 mm), 11 ♀ (cl 3.50–5.43 mm), Shandong, Qingdao, fish farm, 1955-11-18, coll. Feng-Xuan Zhang; MBM129715, 7 ♂ (cl 3.77–5.01 mm), Shandong, Qingdao, fish farm, 1954-10-18; MBM129716, 1 ovig. ♀ (cl 4.02 mm), Shandong, Qingdao, fish farm, 1955-7-19, coll. Jie-Shan Xu; MBM129717, 2 ♂ (cl 5.21, 6.91 mm), 1 ♀ (cl 5.88 mm), 1936-5-4; MBM129719, 1 ♂ (cl 5.38 mm), Shandong, Longkou, Furong Island, 1956-2-12; MBM129726, 6 ♂ (cl 8.21–9.77 mm), 1 ovig. ♀ (cl 6.01 mm), Fujian, Woqian, Dongwo, 1957-3-18, coll. Zhen-Gang Fan & Jie-Shan Xu; MBM129728, 1 ♀ (cl 4.83 mm), Shandong, Qingdao, Guizhou Road, 1954-4-20; MBM129735, 19 ♂ (cl 4.41–7.49 mm), 13 ovig. ♀ (cl 4.32–6.01 mm), Shandong, Qingdao, fish farm, 1954-3-1; MBM129739, 26 ♂ (cl 4.29–8.71 mm), 31 ♀ (cl 3.53–5.78 mm), Qingdao, 1952-11-16, coll. Feng-Xuan Zhang; MBM129676, 1 ♀ (cl 4.95 mm), Zhejiang, Zhoushan, Shenjiamen, 1953-4-18; MBM129677, 1 ♀ (cl 4.13 mm); MBM129722, 3 ♀ (cl 3.42–3.73 mm), 1956-10-17, Shandong, Weihai, Dongzhu Island, coll. Jie-Shan Xu.

Description. Rostrum straight or slightly downward, apex only being somewhat curved upward; rostrum slightly beyond tip of antennular peduncle; dorsal margin with 5–7 teeth, of which proximal one or two placed on carapace behind orbit; 1–3, mostly 2, teeth on ventral margin near apex. Carapace smooth and longer than rostrum. Antennal spine and pterygostomial spine present.

Abdomen smooth, not forming ridges of grooves. Pleurae of fourth and fifth somites acutely pointed at posterior angle.

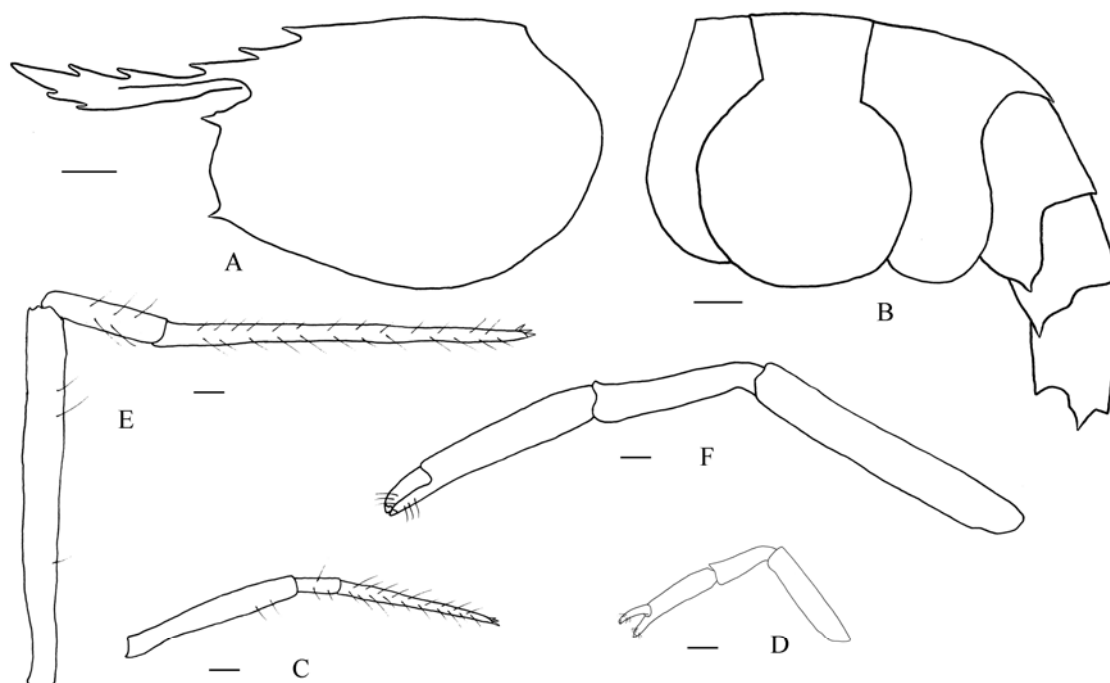


Fig. 26. *Heptacarpus futilirostris* (Bate, 1888). A–D. Female, carapace (5.21 mm); E–F. Male, carapace (6.88 mm). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Third maxilliped in female, lateral view; D. First pereopod in female, lateral view; E. Third maxilliped in male, lateral view; F. First pereopod in male, lateral view. Scale bars = 1 mm.

Telson with 4 pairs of dorsal spines and posterior margin triangular with one pair of long plumose hairs and 2 pairs of spines.

Eye cylindrical; cornea with indistinct ocellar spot, shorter than stalk. Antennular peduncle reaching middle point of antennal scale; each segment with marginal spine; stylocerite sharp, reaching distal margin of second segment of antennular peduncle; outer antennular flagellum thicken and setose in proximal 10–29 segments. Scaphocerite long, narrowed distally, being about 2.6–3.5 times as long as wide; outer margin straight, ending in sharp spine.

Third maxilliped and first pereopod with huge secondary sexual differences. In male, third maxilliped enormously long, reaching with antepenultimate segment beyond antennal scale; ultimate segment slender and elongate, being almost twice as long as carapace, ends in several corneous spines. In female, third maxilliped normal, reaching with whole length or distal two-thirds of ultimate segment beyond antennal scale; ultimate segment shorter than carapace, with seven corneous spines at apex.

First pereopod in female reaching distal tip of antennal scale; while first pereopod in male larger and more robust, reaching distal articulation of penultimate of third maxilliped. Third pereopod overreaching antennal scale by dactylus; merus with 2–5, generally 2–3 outer spines near distal articulation; fifth pereopod reaching distal tip of stylocerite; merus with one subterminal spine.

In male endopod of first pleopod different in shape from following endopods; namely distal 1/4 of it cylinder form with minute coupling hooks, instead of long plumose hairs. Appendix masculine large, near appendix interna of endopod of second pleopod, furnished with long bristles on distal half.

Coloration in life. Carapace with yellowish-brown and light green sloping stripes, abdomen with transversal stripes; eggs brownish green.

Distribution. Bohai Gulf, Yellow Sea, East China Sea; Sea of Japan; living in clear shallow water area, often attached to seaweed.

***Heptacarpus geniculatus* (Stimpson, 1860) (Fig. 27)**

Hippolyte geniculata Stimpson, 1860: 103; Ortmann, 1890: 503 (in part), pl. 37, fig. 3; Doflein, 1902: 636 (in part). Type locality: Hakodate, Hokkaido.

Spirontocaris geniculata Rathbun, 1902: 45 (in part), fig. 19; Yokoya, 1930: 530; 1939: 270.

Spirontocaris alcimede De Man, 1906: 404; 1907: 416, pl. 32, figs 42–46.

Heptacarpus geniculatus Holthuis, 1947: 12, 44; Liu, 1955: 38, pl. 14, figs 1, 2; Miyake *et al.*, 1962: 123; Hayashi & Miyake, 1968: 132, fig. 5; Hayashi, 1979: 21 (in part); Hayashi, 1989: 23; Liu & Zhong, 1994: 559 (list); Chace, 1997: 44 (list); Yang & Kim, 2005: 12, fig. 1; Komai & Ivanov, 2008: 15, figs 10–13, 18, 19.

Material examined. MBM109807, 6 ♀ (cl 4.38–5.01 mm), Lian Island, 1957-9-27, coll. Jie-Shan Xu; MBM109808, 4 ♂ (cl 4.13–4.96 mm), 5 ♀ (cl 5.20–6.19 mm), Liaoning, Changhai, Haiyang Island, 1956-9-27; MBM109809, 1 ♀ (cl 6.81 mm), Shandong, Qingdao, 1952-12-11, coll. Lan Zhang; MBM109811, 5 ♂ (cl 3.92–5.01 mm), 7 ♀ (cl 4.04–4.91 mm), Shandong, Qingdao, Yumingzui, 1955-9-20, coll. Jie-Shan Xu; MBM109812, 10 ♂ (cl 3.85–5.75 mm), 2 ovig. ♀ (cl 6.83, 7.45 mm), Liaoning, Dalian, Xiaoping Island, 1956-10-13; MBM109813, 1 ♂ (cl 4.80 mm), 1 ovig. ♀ (cl 7.55 mm), Shandong, Qingdao, Guizhou Road, 1955-3-19, coll. Jie-Shan Xu; MBM109814, 4 ovig. ♀ (cl 5.22–5.93 mm), Shandong, Yantai, Qingshan, 1954-3-2; MBM109815, 5 ovig. ♀ (cl 6.16–6.96 mm), Shandong, Qingdao, Qianhai, 1952-11-4; MBM109816, 1 ovig. ♀ (cl 6.35 mm), Shandong, Qingdao, Guizhou Road, 1953-12-21; MBM109817, 9 ovig. ♀ (cl 6.06–6.84 mm), Houhai, 1953-1-20; MBM109818, 6 ♀ (cl 5.69–6.12 mm); MBM109819, 6 ♂ (cl 3.53–5.39 mm), 4 ♀ (cl 5.22–5.56 mm), Shandong, Qingdao, Yumingzui, 1957-9-27, coll. Jie-Shan Xu; MBM109822, 21 ♂ (cl 5.28–5.65 mm), 16 ♀ (cl 4.87–6.32 mm), Shandong, Yantai, Zhifu, 1934-5-18; MBM109824, 5 ♂ (cl 5.12–6.73 mm), 4 ♀ (cl 6.14–7.25 mm), 1965-4-17, coll. Hui-Lian Chen; MBM109828, 7 ♂ (cl 6.57–6.94 mm), 32 ovig. ♀ (cl 6.51–7.33 mm), Shandong, Yantai, 1932-11-5; MBM109839, 21 ♂ (cl 5.61–6.59 mm), 28 ♀ (cl 5.94–7.38 mm), Liaoning, Dalian, Xiaoping Island, 1950-11-2; MBM109843, 1 ♂ (cl 4.36 mm), Shandong, Yantai, Fish Market, 1951-4-11.

Description. Rostrum straight, directed forward, generally styliform, reaching distal margin of antennal scale, 1.1–1.5 of carapace length; dorsal margin armed with 4–6 teeth including proximal 1 or 2 on carapace, distal half of dorsal margin unarmed; ventral blade relatively shallow, deepest at proximal to midlength; ventral margin with 6–9 teeth; lateral carina blunt. Dorsal margin of carapace in lateral view straight; suborbital lobe rounded, constricted at base, falling short of distal tip of antennal tooth; pterygostomial angle unarmed or armed with tiny tooth.

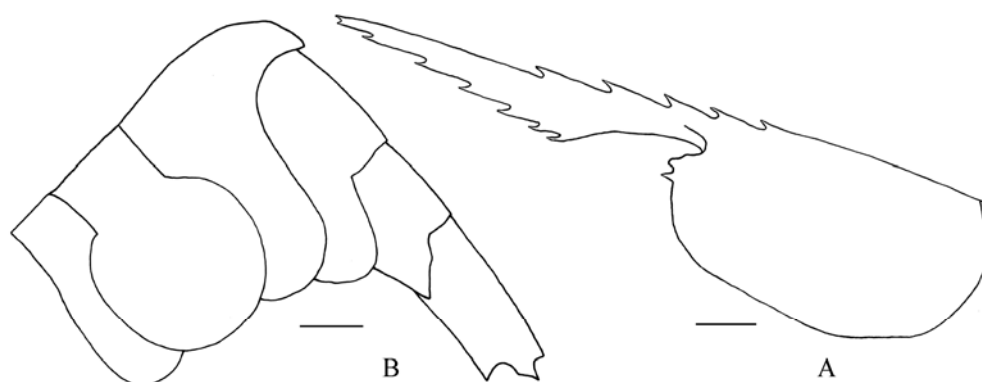


Fig. 27. *Heptacarpus geniculatus* (Stimpson, 1860). A. Carapace, lateral view; B. Abdominal pleurae, lateral view. Scale bars = 1 mm.

Abdomen strongly gibbous. Second somite with faint transverse groove on tergite. Dorsal surface of third tergite strongly elevated in posterior part; posterodorsal margin of tergite weakly produced. Pleurae of anterior four somites broadly rounded, fifth pleuron with moderately large posteroventral tooth; posterolateral margin of fifth pleuron slightly sinuous. Sixth somite about 1.8 times longer than fifth. Telson about 1.20 length of sixth somite, armed with 3–5 pairs of dorsolateral spines; posterior margin with 3 pairs of unequal spines.

Eye-stalk generally subpyriform; cornea slightly wider and shorter than remaining part of eyestalk; ocellus distinct, showing as black spot. Antennular peduncle falling short of midlength of antennal scale. First segment unarmed on dorsodistal margin; stylocerite overreaching distal margin of first segment, acuminate, mesial margin convex or sinuous, closely in touch with first segment; second segment about 1/3 length of first segment, with large spine at dorsolateral distal angle; third segment short, with moderately large spine on dorsodistal margin.

Antenna with basicerite bearing moderately large ventrolateral distal tooth; carpocerite reaching 1/3 length of antennal scale. Antennal scale 5.6 times longer than wide; lateral margin straight or slightly concave; distal lamella rounded, strongly produced, considerably exceeding beyond distolateral tooth.

Third maxilliped falling short of midlength of antennal scale; ultimate segment tapering distally, with seven darkly pigmented corneous spines distally. First pereopod moderately stout, slightly overreaching base of antennal scale; chela 1.5 of carpal length; dactylus about 0.6 length of palm; merus about 1.6 of carpal length. Second pereopods reaching midlength of antennal scale; dactylus about 0.6 of palm length; carpus about 3.80 times longer than chela, divided in 7 unequal articles; ischium subequal in length to merus. Third to fifth pereopods relatively short, similar in structure. Third pereopod overreaching midlength of antennal scale by length of dactylus; biunguiculate dactylus 1/3 of propodal length, armed with 5–6 accessory spinules on flexor margin; propodus with 2 rows of slender spinules on flexor margin; carpus about half of propodal length; merus armed with 6–8 spines ventrally. Fourth pereopod not reaching midlength of antennal scale; merus with 4–7 lateral spines. Fifth pereopod reaching 1/3 of antennal scale; propodus with tufts of grooming setae distally; merus with 3–5 lateral spines.

Endopod of first pleopod elongate subtriangular, with conspicuous appendix interna at terminal position; second pleopod with appendix masculina distinctly longer than appendix interna, with numerous long setae on dorsal surface to tip.

Coloration in life. Variable; body and appendages usually transparent, dark brown, reddish brown, or green. Occasionally with white middorsal longitudinal stripe.

Distribution. Northern China seas; temperate waters in East Asia, Japan and Korea; intertidal to 10 m. Abundant in *Zostera* belts of inshore waters.

***Heptacarpus pandaloides* (Stimpson, 1860) (Fig. 28)**

Hippolyte pandaloides Stimpson, 1860: 103; Doflein, 1902: 637. Type locality: Hakodate Bay, Hokkaido.

Spirontocaris propugnatrix De Man, 1906: 404; Kemp, 1914: 124; Nakazawa & Kubo, 1947: 775.

Spirontocaris pandaloides Balss, 1914: 44; Kemp, 1914: 93; Kemp, 1916: 386; Parisi, 1919: 74; Yokoya, 1930: 530; Yokoya, 1939: 270;

Nakazawa & Kubo, 1947: 775.

Heptacarpus propugnatrix Holthuis, 1947: 13; Miyake, Sakai & Nishikawa, 1962: 123.

Heptacarpus pandaloides Holthuis, 1947: 13, 44; Liu, 1955: 37; Miyake & Hayashi, 1968: 374.

Material examined. MBM109810, 2 ♀ (cl 6.34, 7.36 mm), Liaoning, Dalian, Xiaoping Island, 1952-10-7; MBM109831, 1 ♂ (cl 5.72 mm), Shandong, Qingdao, Qianhai, 1952-10-11; MBM109833, 3 ovig. ♀ (cl 6.06–9.38 mm), fish farm, 1951-8-30; MBM109834, 1 ♂ (cl 6.85 mm); MBM109835, 7 ♂ (cl 4.61–5.43 mm), 2 ♀ (cl 7.20, 7.86 mm), 14 ovig. ♀ (cl 6.36–7.94 mm), Shandong, Qingdao, Qianhai, 1954-10-27; MBM109836, 2 ♀ (cl 5.36, 6.15 mm), 2 ovig. ♀ (cl 6.47, 6.51 mm), Shandong, Qingdao, Xiaoqingdao, 1952-12-1; MBM109837, 4 ♂ (cl 5.96–6.61 mm), 18 ovig. ♀ (cl 6.16–7.73 mm); MBM109840, 2 ovig. ♀ (cl 7.87, 8.79 mm), Shandong, Qingdao, Qianhai, 1952-11-4; MBM109841, 3 ♂ (cl 7.35–7.71 mm), Shandong, Qingdao, Guizhou Road, 1955-6-14; MBM109842, 28 ovig. ♀ (cl 7.11–7.65 mm), Shandong, Qingdao, Huiquan Bay, 1952-11-18; MBM109844, 11 ♂ (cl 4.98–6.49 mm), 3 ♀ (cl 6.74–8.37 mm), Shandong, Qingdao, Xizhen, 1955-7-25, coll. Zhen-Yi Ma; MBM109845, 51 ♂ (cl 4.66–7.14 mm), Liaoning, Changhai, Haiyang Island, 1956-9-27, coll. Jie-Shan Xu; MBM109846, 28 ♂ (cl 6.23–8.01 mm), 13 ♀ (cl 6.16–8.67 mm), 1965-4-17, coll. Hui-Lian Chen.

Description. Rostrum long, 1.3–2.0 times as long as carapace; dorsal margin with 7–10 teeth, of which posterior two situated on carapace; ventral margin with 9–13 teeth. Carapace smooth, with an acute antennal spine; antennal spine separated from obtuse suborbital angle by notch. Pterygostomial angle unarmed or armed with tiny tooth.

Abdomen smooth, third somite not geniculated. Pleuron of fifth somite pointed acutely. Telson usually armed with 5 pairs of dorsal spines, but sometimes 4 to 7 pairs or asymmetrical numbers of spines present; posterior margin with 3 pairs of spines.

Antennular peduncle reaching nearly to proximal third of rostrum; second segment with small marginal spine on lateral side; third segment also armed with similar spine on dorsalside. Antennal scale long and broad, being as long as or slightly longer than carapace; terminal spine on outer margin falling short of lamellar part.

Third maxilliped bearing epipod but destitute of exopod. All pereopods without epipods.

First pereopod rather stout, reaching first segment of antennular peduncle. Second pereopod slender and long, reaching as far as midpoint of antennal scale; carpus subdivided into 7 articles. Third pereopod being longest of all the

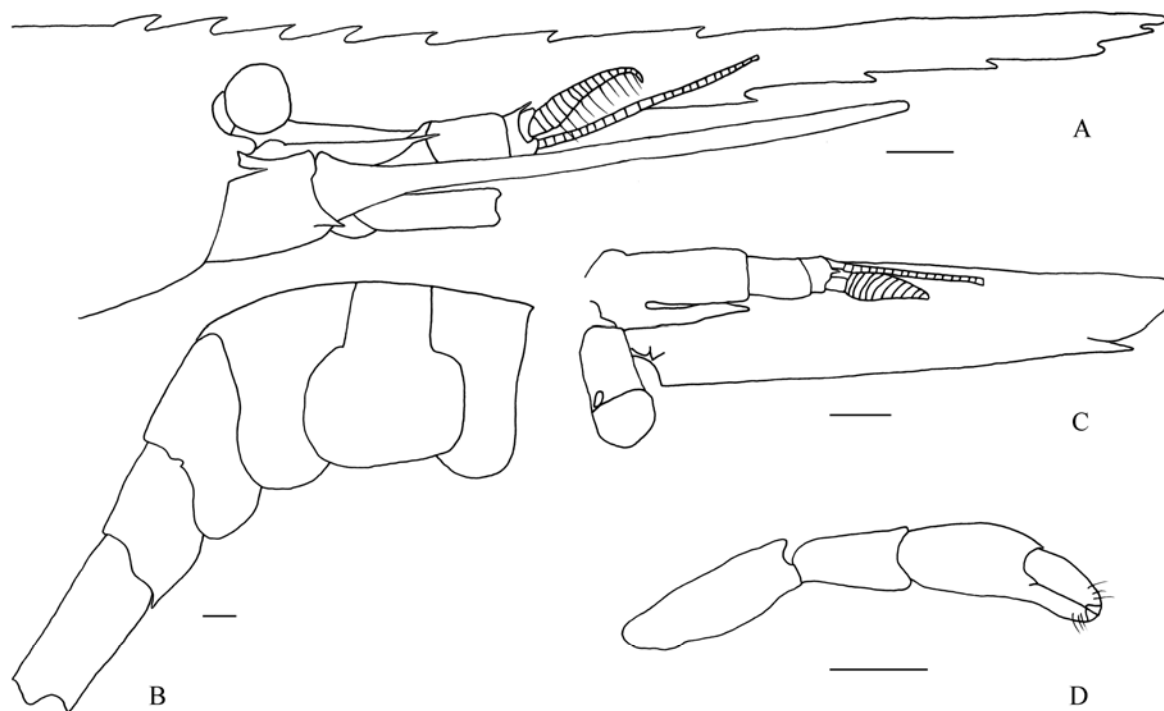


Fig. 28. *Heptacarpus pandaloides* (Stimpson, 1860). A. Anterior part of body, lateral view; B. Abdominal pleurae; lateral view; C. Antennule and antennal scale, dorsal view; D. First pereopod, lateral view. Scale bars = 1 mm.

pereopods, reaching beyond tip of second pereopod by dactylus; dactylus armed with 6 or 7 spinules excluding terminal claw; merus with 7–9 teeth on lateral side. Merus of fourth pereopod armed with 5–7 lateral spines; merus of fifth pereopod with 2–4 lateral spines.

First pleopod of males with elongate endopod, narrowed in distal part to slender appendix interna; second pleopod of males bearing distinct appendix masculine, slightly longer than appendix interna; along innermargin of appendix masculine with many strong hairs.

Coloration in life. Entirely bright green, sometimes with small red spots on lower margins of first three abdominal somites.

Distribution. Bohai Gulf, Yellow Sea; Sea of Japan; 0–30 m.

***Heptacarpus rectirostris* (Stimpson, 1860) (Fig. 29)**

Hippolyte rectirostris Stimpson, 1860: 102; Doflein, 1902: 637. Type locality: Hakodate.

Spirontocaris rectirostris Rathbun, 1902: 44; Balss, 1914: 43; Yokoya, 1930: 531.

Heptacarpus rectirostris Holthuis, 1947: 13; Miyake & Hayashi, 1968: 434.

Material examined. MBM129654, 1 ♀ (cl 6.67 mm), Shandong, Qingdao, Shazikou, 1957-1-20, coll. Yong-Liang Wang, Feng-Xuan Zhang & Zhen-Gang Fan; MBM129655, 1 ovig. ♀ (cl 5.34 mm), 1964-4-17, 29 m, mud, AT, coll. Feng-Shan Xu; MBM129670, 12 ovig. ♀ (cl 4.87–5.71 mm), Hebei, Beidaihe; MBM129674, 1 ovig. ♀ (cl 5.13 mm), 1958-4-2, st. P803, 19.3 m, mud, BT; MBM129678, 1 ovig. ♀ (cl 7.46 mm), 1961-1-1, donated by Yellow Sea Fisheries Research Institute; MBM129679, 4 ♀ (cl 4.06–4.43 mm), 1958-4-7, st. P4, coll. Wei-Quan Zhang; MBM129680, 3 ovig. ♀ (cl 5.39–6.55 mm), 1958-4-7, 10 m, mud, BT; MBM129682, 1 ovig. ♀ (cl 6.41 mm), st. Y108, 1958-3-24, 49.3 m, BT; MBM129684, 2 ♀ (cl 3.66, 3.98 mm), Yellow Sea, 1957-11-16, st. Y803, 56.5 m, BT, coll. Rui-Yu Liu; MBM129686, 2 ♂ (cl 3.16, 3.35 mm), 2 ♀ (cl 3.72, 4.59 mm), 1957-10-28, st. Y108, 50 m, BT, coll. Rui-Yu Liu; MBM129687, 1 ♀ (cl 3.37 mm), 1958-3-23, st. Y501, 19.5 m, mud, BT; MBM129688, 1 ♀ (cl 5.10 mm), 1958-4-7, st. P303, 32.7 m, mud and sand; MBM129689, 1 ♀ (cl 4.04 mm), 1 ovig. ♀ (cl 5.34 mm), 1958-4-2, st. P902, 16 m, mud; MBM129708, 5 ovig. ♀ (cl 4.22–6.01 mm), Shandong, Rongcheng, Longxu Island, 1951-5-6; MBM129709, 3 ♂ (cl 2.17–2.68 mm), Liaoning, Changhai, Haiyang Island, 1956-9-27; MBM129712, 11 ♂ (cl 3.45–4.31 mm), 5 ovig. ♀ (cl 4.21–4.79 mm), Shandong, Yantai, Fish Market, 1951-4-12; MBM129723, 3 ovig. ♀ (cl 5.01–5.47 mm), Shandong, Yantai, Qing Moutain, 1954-3-2; MBM129730, 16 ♂ (cl 2.02–3.79 mm), 37 ovig. ♀ (cl 3.86–5.25 mm), Shandong, Yantai, 1955-4-1, coll. En-Ze Yang.

Description. Rostrum narrow and straight, slightly overreaching distal margin of antennular peduncle; dorsal margin armed with 5 or 6 teeth, of which first 2 or 3 placed on carapace behind orbit; ventral margin with 2, 3 or 4 teeth near apex. Antennalspine developed and acute, separated from round suborbitalangle by notch. Pterygostomial spine small but distinct. Abdomen smooth, not forming ridges or grooves.

Pleurae of fourth and fifth somites pointed posteriorly. Telson shorter than uropod, tapering and armed with usually 4 pairs of dorsal spines or asymmetrically with 3 spines on one side; posterior margin of telson ending in an acute triangular point and armed with one long plumose hair and two, long inner and short outer, spines on either side of acute point.

Eye moderate in size and cylindrical; cornea slightly shorter than stalk and ocular spot distinct in contact with cornea. Antennal peduncle reaching middle of antennal scale; first and second segment each with marginal spine on lateral side; third segment with similar spine at top of dorsal side. Stylocerite pointed anteriorly, just reaching or falling short of distal margin of second segment. Outer antennular flagellum thickened and setose in proximal 10–15 segments. Antennal scale long, being about 2.8 times as long as wide and narrowed distally; outer margin straight and ending in spine. Mandibular palp two-segmented; terminal segment being long and setose; distal apex of incisor process with 4 tiny teeth; molar process bearing tooth and many spinules. Molar process bears tooth and many spinules.

Third maxilliped slender, reaching with distal half or distal third of ultimate segment beyond distal margin of antennal scale; provided with epipod but destitute of exopod; ultimate segment much shorter than carapace and armed with 7 corneous spines at apex. First pereopod rather stout, reaching distal margin of antennal scale; merus slender and cylindrical, being 3.5–4.0 times as long as wide, with diagnostic spine on subterminal portion of outer margin; chela less than twice as long as carpus. Second pereopod slender, reaching beyond distal margin of antennal scale by half of carpus which subdivided into 7 articles; ischium somewhat compressed, being longer than merus; carpus much longer than chela; movable finger shorter than palm. First three pereopods each with epipod. Third pereopod reaching beyond tip of antennal scale by dactylus which bearing 4–5 spines excluding terminal claw; merus armed with series of 4–6 spines along outer margin. Fourth pereopod falling short of apex of antennal scale; merus armed with 3–5 outer spines, situated along distal

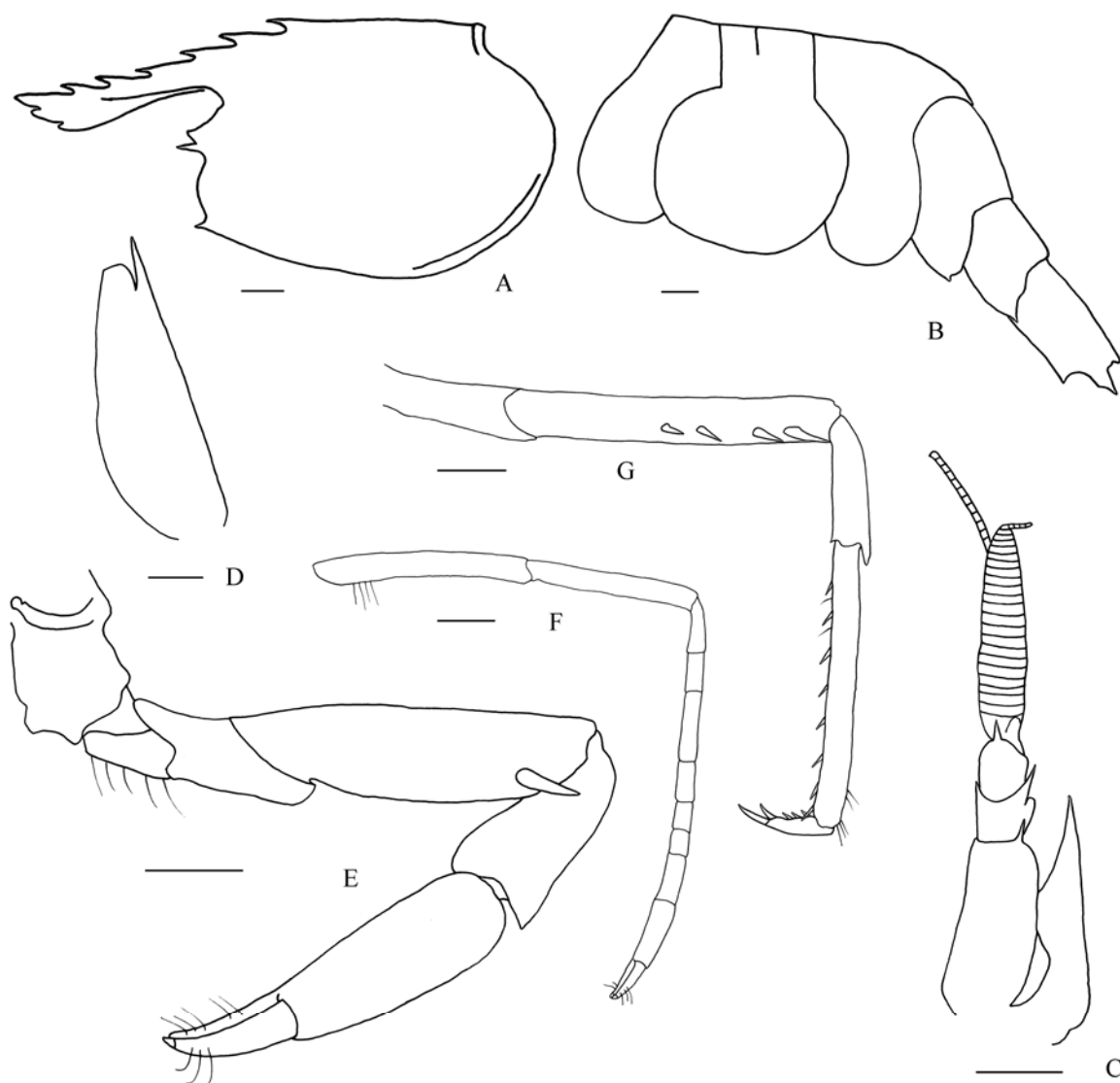


Fig. 29. *Heptacarpus rectirostris* (Stimpson, 1860). A. Carapace, lateral view; B. Abdominal pleurae, lateral view; C. Antennule, dorsal view; D. Antennal scale, dorsal view; E. First pereopod, lateral view; F. Second pereopod, lateral view; G. Third pereopod, lateral view. Scale bars = 1 mm.

two-thirds of outer side. Fifth pereopod reaching tip of antennular peduncle; merus armed with 3–5 spines on distal half.

Endopod of first pleopod in male tapering in distal third, with some retinacula near apex. Endopod of second pleopod in male provided with long slender appendix interna and very short appendix masculina.

Coloration in life. Variable, usually blue-green; eggs orange.

Distribution. Bohai Gulf, Yellow Sea, East China Sea; northern waters of Japan; 5–60 m.

3.2.3.4 *Spirontocaris* Bate, 1888

Spirontocaris Bate, 1888: 576; 595; Calman, 1906: 32 (in part); Holthuis, 1947: 7, 36; 1955: 103. Type species: *Cancer spinus* Sowerby, 1805.

Gender. Masculine.

Diagnosis. Carapace with 2 or more supraorbital teeth; mandible with molar process, incisor process and 2-segmented palp; third maxilliped with exopod and without arthrobranch; first to fifth pereopods without arthrobranch; first pereopod

with epipod; carpus of second pereopod subdivided into 7 articles.

Distribution. West coast of the Pacific Ocean in northern waters; 10–100 mm.

Remarks. To date, only one species of the the genus *Spirontocaris* has been found from China seas.

***Spirontocaris pectinifera* (Stimpson, 1860) (Fig. 30)**

Hippolyte pectinifera Stimpson, 1860: 35. Type locality: Hokkaido.

Spirontocaris pectinifera Balss, 1914: 42, figs. 23–24; Kemp, 1914:124 (list); Yokoya, 1930: 528; Holthuis, 1947: 8 (list).

Spirontocaris crassirostris Kubo, 1951: 271, figs. 11–12.

Material examined. MBM057644, 2 ♂ (cl 3.26, 3.73 mm), Yellow Sea, 1959-7-16, 48 m, brown muddy sand, Agassiz trawl, coll. Jin-Xiang Jiang; MBM057647, 1 ♂ (cl 4.93 mm), Yellow Sea, 1959-10-22, 50.3 m, brown mud, sand and shell fragment, AT, coll. Jin-Xiang Jiang; MBM057648, 6 ♂ (cl 3.87–6.58 mm), Yellow Sea, 1959-10-17, 71.3 m, fine sand and little stone, AT; MBM057652, 1 ♀ (cl 5.18 mm), Yellow Sea, 1959-7-9, 66.5 m, brown muddy sand, AT, coll. Jin-Xiang Jiang; MBM057653, 2 ♂ (cl 4.75, 5.12 mm), 4 ovig. ♀ (cl 3.81–5.06 mm), Yellow Sea, 1959-4-18, 59.6 m, brown mud, BT, coll. Jin-Xiang Jiang; MBM057656, 4 ♂ (cl 3.55–6.50 mm), 2 ♀ (cl 2.71, 3.67 mm), Yellow Sea, Jiangsu, Yancheng, 1959-10-18, 66.5 m, brown sandy mud, AT, coll. Gong-Yi Hu.

Description. Rostrum subcircular in lateral view; dorsal margin with 5–30 teeth, of which posterior 2–4 teeth placed on carapace and armed with some secondary teeth; ventral margin with 2–5 teeth; apex bifid or trifid. Carapace dorsally elevated, with usually 3 supraorbital spines; antennal spine and pterygostomial spine well developed; suborbital angle triangularly pointed. Abdomen dorsally smooth; anterior 5 pleurae with 3–9 marginal spines; sixth somite with large spine on lateral surface near posterior margin. Telson with 3–4 pairs of dorsal spines; posterior margin pointed at middle, posterolateral angles also pointed, with 2 pairs of spines.

Eye moderate; cornea with distinct ocellus; eyestalk bearing strong spine, which reaching midpoint of cornea. Antennular peduncle reaching apex of rostrum; basal segment longer than combination of distal two segments; stylocerite slightly overreaching distal margin of basal segment of antennular peduncle; second segment with large distolateral spine;

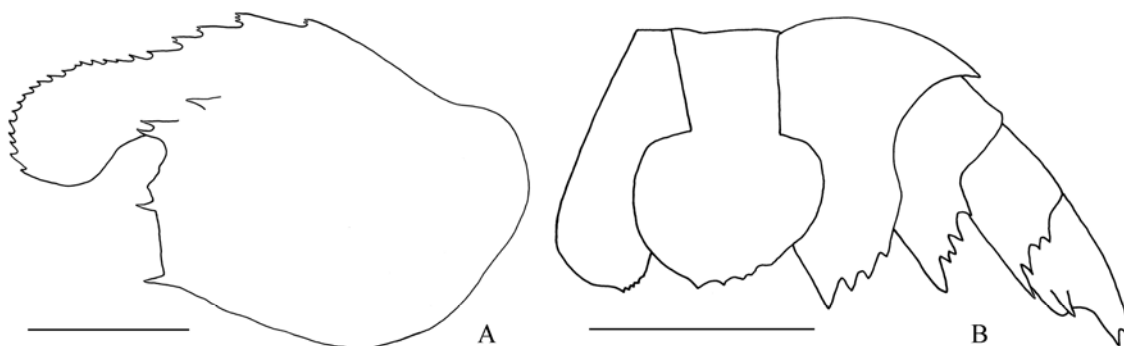


Fig. 30. *Spirontocaris pectinifera* (Stimpson, 1860). A. Carapace, lateral view; B. Abdominal pleurae, lateral view. Scale bars = 1 mm.

third segment short, about half as long as second segment, with slender dorsal marginal spine. Antennal scale triangular in dorsal view, about 2.0 times as long as wide, overreaching rostrum by distal 1/3; outer margin ending in lateral spine beyond lamella.

Third maxilliped slightly overreaching distal margin of antennal scale. First pereopod stout, reaching distal end of antennular peduncle. Second pereopod overreaching distal margin antennal scale by chela; carpus subdivided into 7 articles. Third to fifth pereopods similar in structure. Dactylus of these pereopods with 4 or 5 spinules on flexor margin; merus of third pereopod with 2–3 distolateral spines; merus of fourth pereopod with only 1 distolateral spine; merus of fifth pereopod unarmed. Endopod of first pleopod tapering in male and broad in female; endopod of second pleopod in male with appendix interna and appendix masculina of equal length.

Distribution. Yellow Sea; Sea of Japan, Sea of Okhotsk; 30–80 m.

3.2.3.5 *Thor* Kingsley, 1878

Thor Kingsley, 1878: 94. Type species: *Thor floridanus* Kingsley, 1878.

Gender. Masculine.

Diagnosis. Rostrum of adult individual short, dorsal margin with more than 1 tooth; carapace with supraorbital tooth or not; third segment of antennular peduncle with subtriangular dorsal scale; mandible only with molar process and incisor process; third maxilliped with exopod; carpus of second pereopod subdivided into 6 articles; all pereopods without arthrobranch.

Distribution. South China Sea; Pantropical from Red Sea and South Africa to Ascension Island, Western Pacific, South Atlantic; 0–60 m.

Remarks. To date, three species of the genus *Thor* have been certainly reported from the China seas, including one new species. They can be distinguished by the following key.

Key to species of the genus *Thor* from China seas.

1. Pereopod without epipod.....*T. amboinensis* (De Man, 1888)
Pereopod with epipod.....2
2. Only first pereopod with epipod.....*T. hainanensis* Xu & Li, 2014
First 2 pereopods with epipods.....*T. singularis* sp. nov.

Thor amboinensis (De Man, 1888) (Fig. 31)

Hippolyte amboinensis De Man, 1888: 535. Type locality: Ambon, Indonesia.

Thor discosomatis Kemp, 1916: 388, fig. 1, pi. 36: fig. 1.

Thor amboinensis Holthuis, 1947: 50; Chace, 1972: 130, figs. 55, 56; 1997: 92.

Material examined. MBM136466, 1 ovig. ♀ (cl 1.69 mm), Hainan, Nansha Islands, Yongshujiao, 1993-5-17, no. 93-032B, coll. Xin-Zheng Li; MBM136554, 3 ♂ (cl 1.55–2.77 mm), 1 ovig. ♀ (cl 3.23 mm), Guangdong, Guangzhou, Shu Island, 1958-5-5, no. 58C-0308, coll. Zhen-Gang Fan.

Description. Rostrum short, more slender in male than in female; falling short of distal end of basal segment of antennular peduncle; dorsal margin with 2–4 teeth; ventral margin generally unarmed. Carapace with antennal tooth, without supraorbital tooth.

Eye subcylindrical, stalk longer than cornea. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth; sixth somite twice as long as fifth somite. Telson 1.4 times as long as sixth somite; dorsal surface with 4 pairs of dorsolateral spines and 4 pairs of terminal spines.

Antennular peduncle reaching nearly to midpoint of antennal scale; basal segment slightly longer than distal 2 segments combined; second segment with acute distolateral spine; third segment of antennular peduncle with subtriangular dorsal scale; stylocerite reaching or slightly overreaching distal end of second segment, armed with little indistinct tooth near proximal end of lateral margin. Antennal scale 2.5 times as long as wide; lateral margin straight, with distolateral tooth exceeded by lamina.

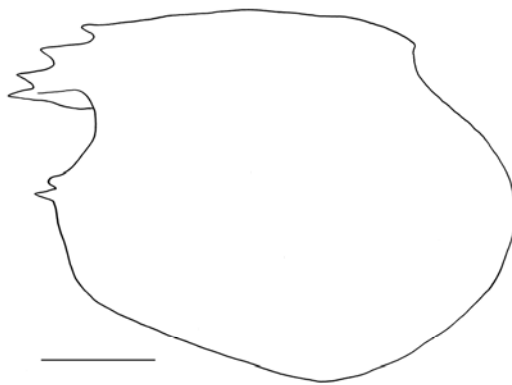


Fig. 31. *Thor amboinensis* (De Man, 1888), carapace, lateral view. Scale bar = 1 mm.

Third maxilliped with exopod; overreaching distal margin of antennal scale by 1/3 of ultimate segment, which with 8–10 corneous spines distally. First pereopod reaching distal margin of antennal scale; dactylus shorter than palm; carpus subequal in length to merus. Second pereopod overreaching distal margin of antennal scale by dactylus and half of propodus; dactylus slightly shorter than palm; carpus subdivided into 6 articles; merus 0.7 times as long as carpus; ischium shorter than merus. Third pereopod in male prehensile, subchelate. Third pereopod in female overreaching distal margin of antennal scale by dactylus and propodus; flexor margin of biunguiculate dactylus with 3–4 spinules; merus with 1 or 2 distolateral spines. Fourth pereopod overreaching distal margin of antennal scale by dactylus and half of propodus; merus generally with only distolateral spine. Fifth pereopod overreaching distal margin of antennal scale by dactylus; outer margin of merus generally unarmed.

Distribution. South China Sea; Africa East, Arabia Sea, Bay of Bengal, Ryukyu Islands, Philippines, Indonesia, Hawaii Islands, Bermuda, Mexico Bay, Caribbean; shallow water, usually with sea anemones or corals.

***Thor hainanensis* Xu & Li, 2014** (Figs 32–34)

Thor hainanensis Xu & Li, 2014b: 394, figs. 1–5.

Material examined. MBM136607, 1 ovig. ♀ (cl 1.80 mm), Hainan, Sanya, intertidal, 1997-3-5, no. CJ97C-224, coll. Xin-Zheng Li; MBM136405, 1 ♂ (cl 1.90 mm), Hainan, Qionghai, intertidal, 1992-4-4, no.92C-1471, coll. Xin-Zheng Li; MBM136387, 5 ovig. ♀ (cl 1.70–2.10 mm), Hainan, Lingao, intertidal, 1990-12-2, no.90C-353, coll. Hui-Lian Chen; MBM136589, 4 ovig. ♀ (cl 1.80–1.90 mm), Hainan, Sanya, intertidal, 1997-3-1, no.CJ97C-119, coll. Xin-Zheng Li; MBM136394, 5 ovig. ♀ (cl 1.80–2.00 mm), Hainan, Lingshui, 1992-3-26, no.92C-160D, coll. Xin-Zheng Li; MBM136395, 5 ♂ (cl 1.71–2.36 mm), 8 ovig. ♀ (cl 1.87–2.65 mm), Hainan, Sanya, Yalong Gulf, Yezhu Island, 1992-3-19, diving, 3–7 m, no.92C-062B, coll. Xin-Zheng Li.

Description. Small hippolytid shrimp without supraorbital spine. Rostrum about half length of carapace, nearly straight, slightly descending, reaching but not exceeding basal segment of antennular peduncle; dorsal margin with three teeth, posterior one on carapace posterior to margin of orbit; ventral margin armed with only one subterminal tooth, giving rostrum bifid appearance; lateral carina feebly developed. Carapace with inferior orbital angle slightly produced, subacute; antennal tooth moderately developed; pterygostomian tooth minute; anterolateral margin between antennal tooth and pterygostomian tooth obscurely angulate.

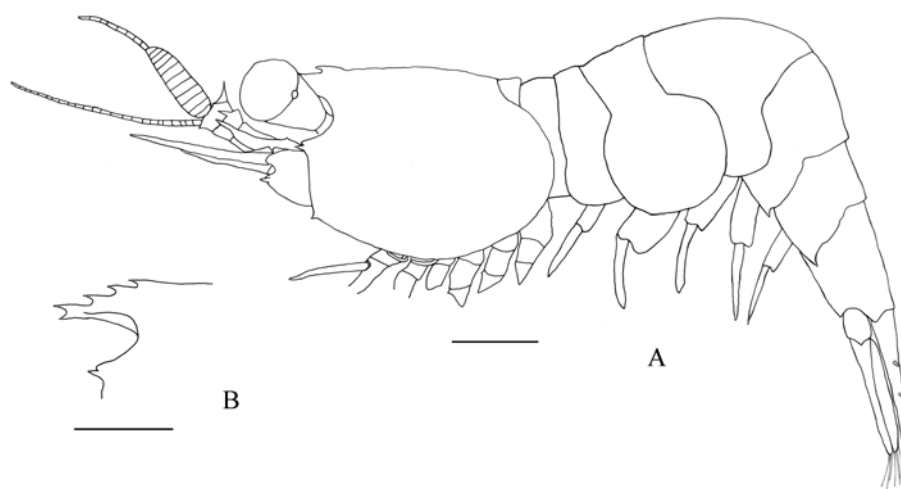


Fig. 32. *Thor hainanensis* Xu & Li, 2014, ovigerous female (cl 1.8 mm) (After Xu & Li, 2014b). A. Body, lateral view; B. Rostrum, lateral view. Scale bars = 1 mm.

Abdomen rounded dorsally. Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Sixth somite 1.9 times as long as fifth mid-dorsal length. Telson about 1.2 times longer than sixth abdominal somite; dorsal surface with 3–5 pairs of dorsolateral spines and 3 pairs of terminal spines, lateral pair similar to dorsolateral series.

Eye subpyriform, pigmented; cornea with distinct ocellar spot, shorter than stalk. Antennular peduncle reaching distal 0.4 of antennal scale. Basal segment with strong subdistal, ventromesial tooth; sharp stylocerite reaching slightly beyond

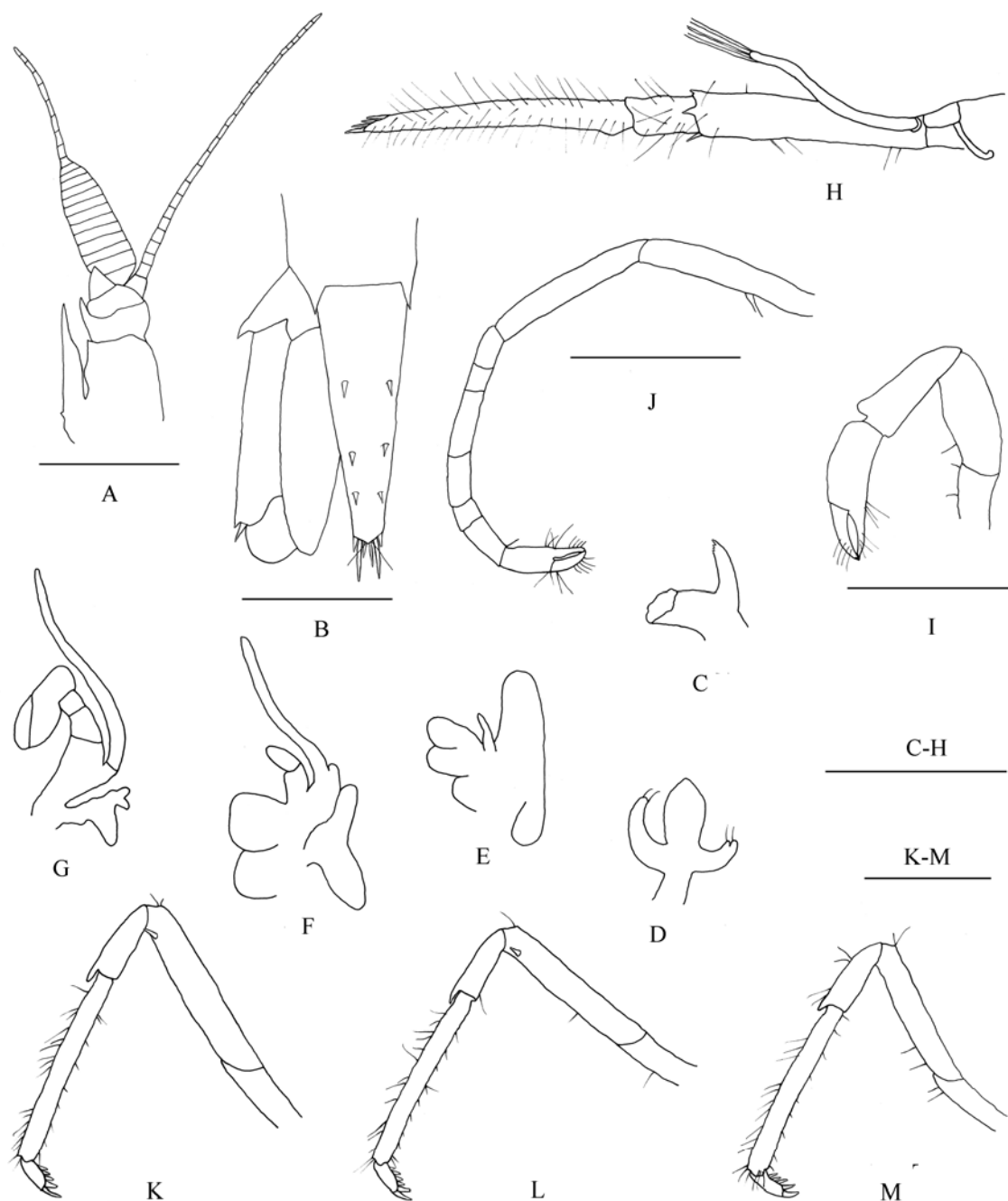


Fig. 33. *Thor hainanensis* Xu & Li, 2014, ovigerous female (cl 1.8 mm) (After Xu & Li, 2014b). A. Antennule, dorsal view; B. Telson and uropod, dorsal view; C. Left mandible, external view; D. Left maxillule, external view; E. Left maxilla, external view; F. Left firstmaxilliped, external view; G. Left second maxilliped, external view; H. Left third maxilliped, lateral view; I. Left first pereopod, lateral view; J. Left second pereopod, lateral view; K. Left third pereopod, lateral view; L. Left fourth pereopod, lateral view; M. Left fifth pereopod, lateral view. Scale bars = 1 mm.

distal margin of second segment, armed with little indistinct tooth near proximal end of lateral margin; second segment with curved lateral spine reaching beyond mid-length of distal segment; third segment with subtriangular dorsal scale. Outer flagellum stout and heavily setose. Inner flagellum slender, elongate, with 23–28 segments. Antennal peduncle with basicerite bearing strong distal, ventrolateral tooth, dorsodistal angle bluntly produced. Carpocerite overreaching second segment of antennular peduncle. Antennal scale shorter than length of carapace, 2.4 times as long as wide; lateral margin faintly concave, with distolateral tooth exceeded by lamina.

Mouthparts typical of genus. Mandible without palp; incisor process slender, with series of four subequal, tiny, distal teeth; molar process stout.

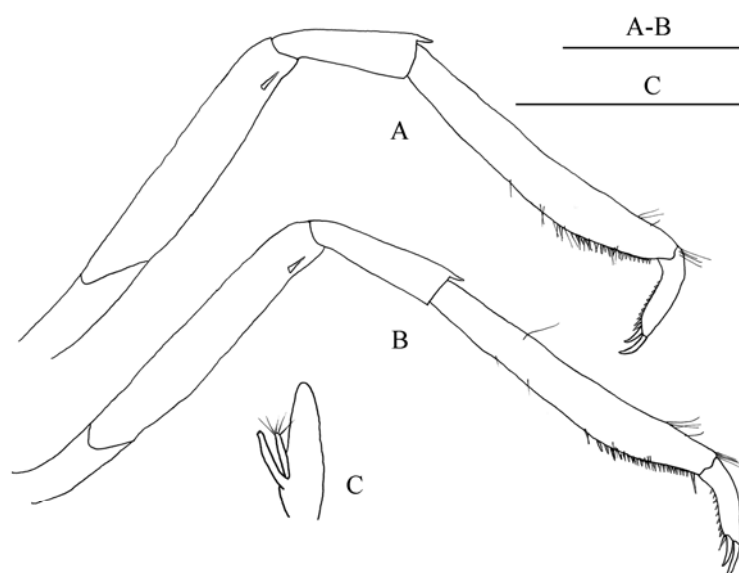


Fig. 34. *Thor hainanensis* Xu & Li, 2014. Male (cl 1.9 mm) (After Xu & Li, 2014b). A. Right third pereopod, lateral view; B. Right fourth pereopod, lateral view; C. Endopod of second pleopod, ventral view. Scale bars = 1 mm.

Third maxilliped long and slender, somewhat beyond antennal scale; ultimate segment 4.3 times longer than penultimate segment, with corneous spines distally; antepenultimate segment subequal in length to ultimate segment, distoventral margin with small spine. Exopod exceeding middle of antepenultimate segment; epipod present.

First pereopod with strap-like, terminally hooked epipod; moderately stout, falling short of distal margin of antennal scale. Chela about 1.2 times longer than carpus, 3.1 times longer than wide; dactylus with bifid tip, slightly longer than half length of palm; palm subcylindrical, 2.1 times as long as wide, fixed finger terminating in single corneous claw. Carpus 3.1 times longer than wide. Merus subequal in length to carpus, 2.3 times as long as wide. Second pereopod slender and chelate; carpus with six sub-segments, third sub-segment longest. Merus shorter than carpus, 6.3 times longer than width. No epipod.

Third pereopod in female overreaching antennal scale by length of dactylus; biunguiculate dactylus 0.2 times as long as propodus, about 2.6 times longer than high, armed with three accessory spines along entire length of flexor margin; propodus 10 times as long as wide; flexor margin with about 9–10 spinules, spinules increasing in size distally; carpus less than half length of propodus, 2.9–4.2 times longer than wide. Merus about equal to propodus, 5.9 times longer than deep, with 1 or 2 prominent lateral spines distally. Ischium unarmed. Fourth pereopod in female similar to third pereopod, overreaching antennal scale, biunguiculate dactylus armed with 4 accessory spines along entire length of flexor margin; merus with 1 distolateral spine. Third pereopod in male prehensile, subchelate. Dactylus with bifid tip and many closely appressed spinules on flexor margin; propodus more than twice as long as dactylus, distal third of flexor margin with densely spinules; carpus less than half as long as propodus; merus slightly shorter than propodus, armed with strong spine near distal end of lateral surface. Fourth pereopod in male similar to third pereopod, prehensile, subchelate; merus also armed with one distolateral spine. Fifth pereopod with 0 or 1 meral spine. Pleopods without special features. Second pleopod in male with appendix masculine moderately stout, almost 6 times as long as wide, about 0.9 length of appendix interna, bearing about 5 long stiff setae.

Uropods longer than telson, fringed with setae; outer branch of uropod with fixed tooth and movable spine along suture.

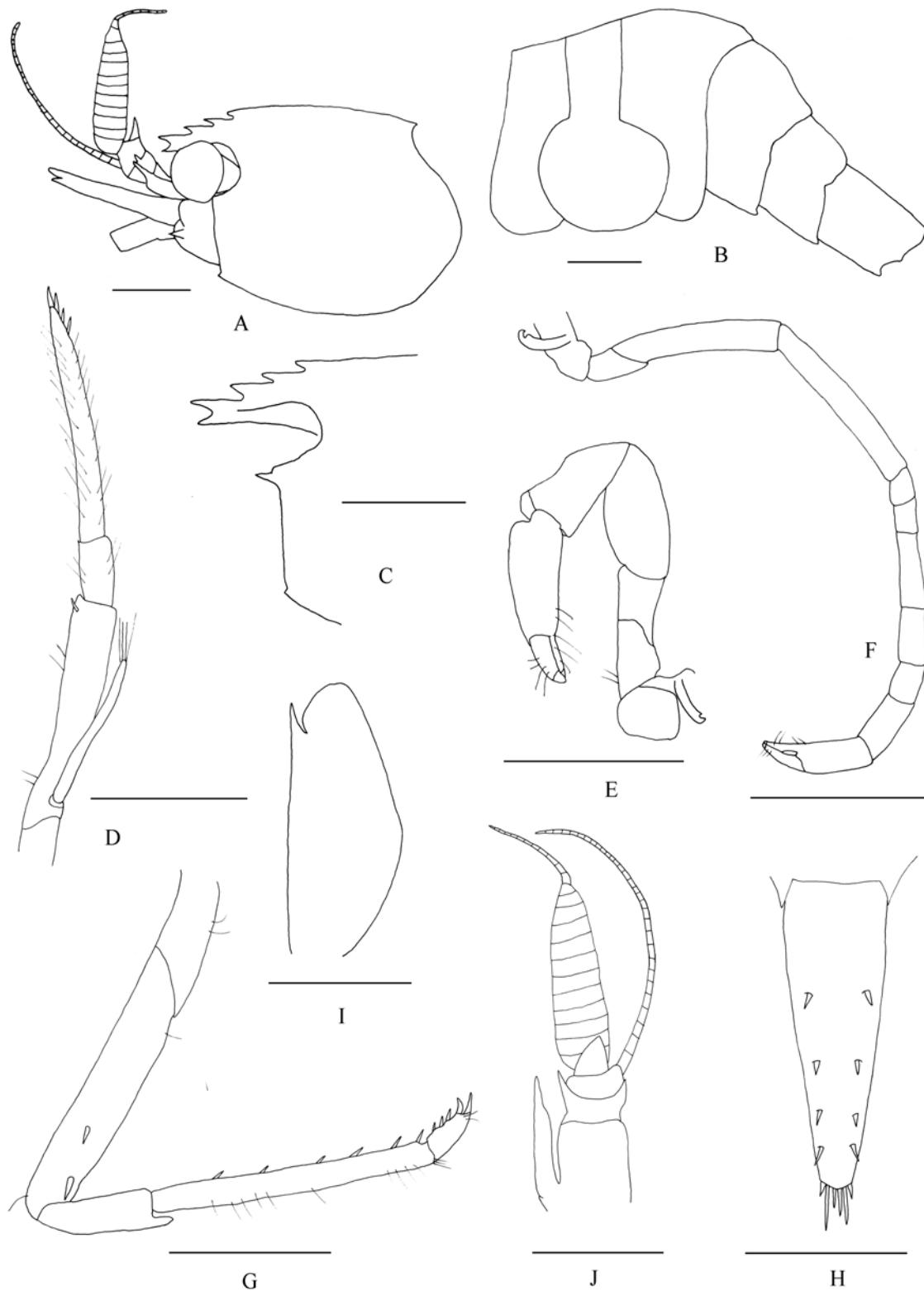


Fig. 35. *Thor singularis* sp. nov. A. Carapace and cephalic appendages, lateral view; B. Abdominal pleurae, lateral view; C. Rostrum, lateral view; D. Third maxilliped, lateral view; E. First pereopod, lateral view; F. Second pereopod, lateral view; G. Third pereopod, lateral view; H. Telson, dorsal view; I. Antennal scale, dorsal view; J. Antennule, dorsal view. Scale bars = 1 mm.

Coloration in life. Unknown.

Distribution. Only known from the type locality, Hainan Island; 2–15 m.

Remarks. The distinct morphological character of the species is the presence of an epipod on the first pereopod. The prehensile and subchelate fourth pereopod of male is also rare and unique in the genus.

***Thor singularis* sp. nov.** (Fig. 35)

Material examined. Holotype, ovigerous female, MBM136568, cl 1.94 mm, intertidal, Sanya, Hainan Island, 4 March, 1997, coll. Xin-Zheng Li.

Description. Rostrum short, about half length of carapace; dorsal margin with 3 teeth; ventral margin with only 1 tooth. Carapace with moderately developed antennal tooth and minute pterygostomian tooth.

Pleurae of fourth and fifth abdominal somites each with small posteroventral tooth. Sixth somite 1.8 times as long as fifth mid-dorsal length. Telson about 1.3 times longer than sixth abdominal somite; dorsal surface with 4 pairs of dorsolateral spines and 3 pairs of terminal spines.

Antennular peduncle slightly overreaching midpoint of antennal scale; basal segment longer than distal 2 segments combined; second segment with acute distolateral spine; third segment of antennular peduncle with subtriangular dorsal scale; stylocerite reaching distal end of third segment, armed with little indistinct tooth near proximal end of lateral margin. Antennal scale 2.2 times as long as wide; lateral margin straight, with distolateral tooth exceeded by lamina. Antennal peduncle with basicerite bearing strong distal, ventrolateral tooth; carpocerite overreaching second segment of antennular peduncle.

Third maxilliped with exopod; overreaching distal margin of antennal scale by 1/3 of ultimate segment, which with 6–8 corneous spines distally; ultimate segment subequal in length to antepenultimate segment. First and second pereopods with strap-like, terminally hooked epipods.

First pereopod stout, reaching near to midpoint of antennal scale; dactylus about 0.4 times as long as palm; carpus about 0.7 times as long as chela; merus slightly longer than carpus.

Carpus of second pereopod subdivided into 6 articles, of which proximal third one longest; dactylus about 0.7 times

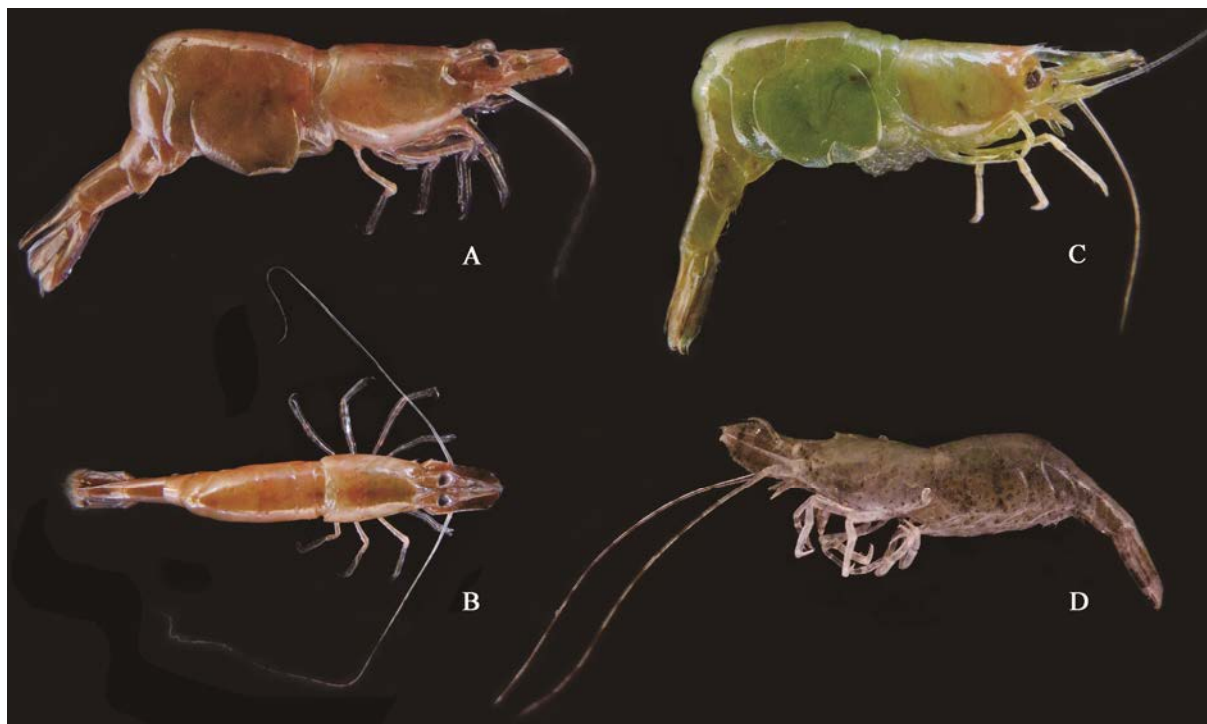


Fig. 36. Adults. A–C. *Hippolyte ventricosus* H. Milne Edwards, 1837, from seagrass bed, subtidal, Sanya, Hainan Island; D. *Latreutes* sp., from sandy intertidal zone, Dongfang, Hainan Island.

as long as palm; ischium slightly shorter than merus.

Third pereopod overreaching distal margin of antennal scale by dactylus; flexor margin of biunguiculate dactylus with 3 spinules; flexor margin of propodus with 2 rows of 14 or 15 spinules; merus with 2 distolateral spines, slightly shorter than propodus. Fourth pereopod and fifth pereopod in similar structure with third pereopod; merus with only 1 distolateral spine.

Distribution. Only known from the intertidal zone of Hainan Island.

Etymology. The Latin “*singularis*”, single, prefers the single type specimen.

Remarks. The new species shares many morphological characters with *Thor hainanensis* Xu & Li, 2014. It can be distinguished from the later by first 2 pereopods with epipods. In fact, the epipods on the first two pereopods can differentiate from the other members of the genus *Thor*. The existence of epipod among different pereopods is considered to be fixed at interspecific level and all the described species of this genus lack the epipod on the second pereopod. Holthuis (1993) used the epipod to distinguish the *Thor* Kingsley, 1878 and *Thoralus* Holthuis, 1947. *Thoralus* was treated as a junior synonym of *Eualus* Thallwitz, 1892. *Thor* is differentiated from *Eualus* distinctly by the third segment of antennular peduncle with subtriangular dorsal scale, in *Eualus*, the third segment of antennular peduncle lacks the subtriangular dorsal scale.

Funding This study was supported by the National Natural Science Foundation of China (41376163), the National Basic Research Program of China (973 Program) (No. 2011CB403605), the Special Fund for strategic pilot technology of Chinese Academy of Sciences (A) (XDA11020303), the project of the S & T basic work from the Ministry of Science and Technology of China (2014FY110500) and the IOCAS (2012IO060105).

Acknowledgments We are grateful to the managers of the MBMCAS for their help with specimens sorting.

References

- Baker, W. H. 1904. Notes on South Australian Decapod Crustacea, part 1. *Transactions of the Royal Society of South Australia*, 28: 146–161, plates 27–31.
- Balss, H. 1914. Ostasiatische Decapoden, II: die Natantia und Reptantia. In: Doflein, F. (ed.), *Beiträge zur Naturgeschichte Ostasiens, Dekapoden*, part 7 in volume 2. *Abhandlungen der Bayerischen Akademie der Wissenschaften*, München, 2 (supplement), 10. pp. 1–101, 50 figures, 1 plate.
- Barnard, K. H. 1950. Descriptive catalogue of South African Decapod Crustacea. *Annals of the South African Museum*, 38: 1–837, figures 1–154.
- Bate, C. S. 1888. Report on the Crustacea Macrura collected by H. M. S. Challenger during the years 1873–1876. Report on the Scientific Results of the Voyage of H. M. S. Challenger during the years 1873–76, *Zoology*, 24: 1–942.
- Boone, L. 1935. Crustacea: Anomura, Macrura, Euphausiacea, Isopoda, Amphipoda and Echinodermata: Asteroidea and Echinoidea. scientific results of the world cruise of the yacht “Alva,” 1931, William K. Vanderbilt, Commanding. *Bulletin of the Vanderbilt Marine Museum*, 6: 1–264.
- Borradaile, L. A. 1915. Notes on Carides. *Annals and Magazine of Natural History*, series 8, 15: 205–213.
- Bražnikov, V. 1903. Sur une nouveau genre et une nouvelle espèce de decapodes, famille Hippolytidae. *Annuaire du Musée Zoologique de l'Académie Impériale des Sciences de St. -Petersbourg*, 8: 44–45.
- Bruce, A. J. 1976. A report on a small collection of shrimps from the Kenya National Marine Parks at Malindi, with notes on selected species. *Zoologische Verhandelingen Uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden*, 145: 1–72, figures 1–23.
- Bruce, A. J. 1990. Redescriptions of five Hong Kong Carideans first described by William Stimpson, 1860. In: Morton, B. (ed.), *Proceedings of the Second International Marine Biological Workshop: The Marine Flora and Fauna of Hong Kong and Southern China*, 1986. Hong Kong University Press, pp. 569–610, figures 1–28.
- Bruce, A. J. 1997. A new genus of hippolytid shrimp (Crustacea: Decapoda: Hippolytidae) for *Thor maldivensis* Borradaile. *Memoirs of the Queensland Museum*, 42: 13–23.
- Bruce, A. J. 1998. A new name, *Thinora*, proposed for the preoccupied name *Thorina* Bruce (Crustacea: Decapoda: Hippolytidae). *Memoirs of the Queensland Museum*, 42: 398.
- Calman, W. T. 1906. Notes on some genera of the Crustacean family Hippolytidae. *Annals and Magazine of Natural History*, series 7, 17: 29–34.

- Chace, F. A. Jr. 1972. The shrimps of the Smithsonian-Bredin Caribbean expeditions with a summary of the West Indian shallow-water species (Crustacea: Decapoda: Natantia). *Smithsonian Contributions to Zoology*, 98: 1–179.
- Chace, F. A. Jr. 1997. The caridean shrimps (Crustacea: Decapoda) of the *Albatross* Philippine expedition, 1907–1910, part 7: families Atyidae, Eugeonatonotidae, Rhynchocinetidae, Bathypalaemonellidae, Processidae, and Hippolytidae. *Smithsonian Contributions to Zoology*, 587: 1–106.
- Christoffersen, M. L. 1979. Campagne de la Calypso au large des Cotes Atlantiques de l’Amerique du Sud (1961–1962). I. 36. Decapod Crustacea: Alpheoidea. In: Resultats Scientifiques des Campagnes de la Calypso. *Annales de le Institut Oceanographique de Monaco, Paris*, 55 (Suppl.): 297–377.
- Christoffersen, M. L. 1987. Phylogenetic relationships of Hippolytid genera, with an assignment of new families for the Crangonoidea and Alpheoidea (Crustacea, Decapoda, Caridea). *Cladistics*, 3: 348–362, figures 1–8.
- Christoffersen, M. L. 1990. A new superfamily classification of the Caridea (Crustacea: Pleocyemata) based on phylogenetic pattern. *Zeitschrift für Zoologische Systematik und Evolutionsforschung*, 28: 94–106.
- Dana, J. D. 1852a. Crustacea, Part 1. In: United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes, U. S. N. Volume 13. Philadelphia. 685 pp. .
- Dana, J. D. 1852b. Conspectus Crustaceorum quae in Orbis Terrarum circumnavigatione, Carolo Wilkes e classe Reipublicae Foederatae Duce, lexit et descripsit. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1852: 10–28.
- De Grave, S. and Fransen, C. H. J. M. 2011. Carideorum catalogus: the recent species of the Dendrobranchiate, Stenopodidean, Procarididean and Caridean shrimps (Crustacea: Decapoda). *Zoologische Mededelingen*, 85: 195–589.
- De Grave, S., Li, C-P, Tsang, L-M, Chu, K-H and Chan, T-Y 2014. Unweaving hippolytoid systematics (Crustacea, Decapoda, Hippolytidae): resurrection of several families. *Zoologica Scripta*, 43: 496–507.
- De Haan, W. 1833–1850. Crustacea. In: von Siebold, P. F. (ed.), Fauna Japonica sive Descriptio Animalium, quae in Itinere per Japoniam. Jussu et Auspiciis Superiorum, qui Summum in India Batava Imperium Tenent, Suscepto, Annis 1823–1830 Collegit, Notis, Observationibus et Adumbrationibus Illustravit. i–xxxix, ix–xvi, pp. 1–243, plates A–J, L–Q, 1–55, circ. tab. 2. Lugduni-Batavorum.
- De Man, J. G. 1888. Bericht über die von Herrn Dr. J. Brock im indischen Archipel gesammelten Decapoden und Stomatopoden. *Archiv für Naturgeschichte*, 53: 215–600.
- De Man, J. G. 1902. Die von Herrn Professor Kukenthal im Indischen Archipel gesammelten Dekapoden und Stomatopoden. In: Kukenthal, Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft*, 25: 467–929, plates 19–27.
- De Man, J. G. 1906. Diagnoses of five new species of Decapod Crustacea and of the hitherto unknown male of *Spirontocaris rectirostris* (Stimps.) from the Inland Sea of Japan, as also of a new species of *Palaemon* from Darjeeling, Bengal. *Annals and Magazine of Natural History*, series 7, 17: 400–406.
- Debelius, H. 1984. Armoured Knights of the Sea. Essen. 120 pp., 93 figures.
- Doflein, F. 1902. Ostasiatische Dekapoden. *Abhandlungen der Mathematisch-Physikalischen Klasse der Königlich Bayerischen Akademie der Wissenschaften*, 21: 613–670.
- Edmondson, C. H. 1925. Marine zoology of tropical central Pacific. Crustacea. *Bulletin of the Bernice P. Bishop Museum*, 27: 3–62.
- Edmondson, C. H. 1946. Reef and Shore Fauna of Hawaii. *Special Publications of the Bernice P. Bishop Museum*, 22: 1–381, figures 1–223.
- Hayashi, K. I. and Miyake, S. 1968. Studies on the hippolytid shrimps from Japan, V. Hippolytid fauna of the sea around the Amakusa Marine biological laboratory. *Ohmu*, 1: 121–163.
- Hayashi, K. I. 1979. Studies on the hippolytid shrimps from Japan, VII. The genus *Heptacarpus* Holmes. *The Journal of Shimonoseki University of Fisheries*, 28: 11–32, figures 1–6.
- Hayashi, K. I. 1982. The Central Pacific shrimps of the genus *Hippolyte*, with a description of two new species (Decapoda, Caridea, Hippolytidae). *Pacific Science*, 35: 185–196, figures 1–6.
- Hayashi, K. I. 1989. *Saron rectirostris* Hayashi and *S. inermis* Hayashi, two shrimps from Indonesia (Crustacea: Decapoda: Hippolytidae). *Revue Française d’Aquariologie et Herpetologie*, 16: 23–32, figures 1–8, photos 1–3.
- Heller, C. 1862. Beiträge zur Crustaceen-Fauna des rothen Meeres. II. *Sitzungsberichte der Akademie der Wissenschaften in Wien*, 44: 241–295.
- Holmes, S. J. 1900. Synopsis of California Stalk-eyed Crustacea. *Occasional Papers of the California Academy of Sciences*, 7: 1–262, figures 1–6, plates 1–4.
- Holthuis, L. B. 1947. The Decapoda of the Siboga Expedition. Part IX. The Hippolytidae and Rhynchocinetidae collected by the Siboga and Snellius expeditions with remarks on other species. *Siboga Expeditie*, 39a⁸: 1–100.
- Holthuis, L. B. 1973. Caridean shrimps found in land-locked saltwater pools at four Indo-West Pacific localities (Sinai Peninsula, Funafuti Atoll, Maui and Hawaii Islands), with the description of one new genus and four new species. *Zoologische Verhandelingen, Leiden*, 128: 1–48, figs. 1–13, pls. 1–7.

- Holthuis, L. B. 1993. The recent genera of the caridean and stenopodidean shrimps (Crustacea, Decapoda): with an appendix on the order Amphionidacea. Leiden: Nationaal Natuurhistorisch Museum. 328 pp.
- Jones, D. A. 1986. A Field Guide to the sea shores of Kuwait and the Arabian Gulf, Kuwait University Press. 192 pp.
- Kemp, S. 1914. Notes on Crustacea Decapoda in the Indian Museum, V: Hippolytidae. *Records of the Indian Museum*, 10: 81–129, plates 1–7.
- Kemp, S. 1916. Notes on Crustacea Decapoda in the Indian Museum, VII: Further Notes on Hippolytidae. *Records of the Indian Museum*, 12: 385–405, figures 1–5, plate 36.
- Kemp, S. 1925 (1926). Notes on Crustacea Decapoda in the Indian Museum, XVII: On various Caridea. *Records of the Indian Museum*, 27 (4): 249–343, figs. 1–24.
- Kensley, B. 1972. Shrimps and prawns of southern Africa. South African Museum, Cape Town. 65 pp.
- Kingsley, J. S. 1879 (1878). List of the North American Crustacea belonging to the Sub-order Caridea. *Bulletin of the Essex Institute*, 10: 53–71.
- Komai, T. and Fujiwara, Y. 2012. Description of a new species of the hippolytid shrimp genus *Eualus* Thallwitz, 1892 from Japan, and clarification of the status of *E. kikuchii* Miyake & Hayashi, 1967 (Crustacea: Decapoda: Caridea). *Zootaxa*, 3546: 68–80.
- Komai, T. and Ivanov, B. G. 2008. Identities of three taxa of the hippolytid shrimp genus *Heptacarpus* (Crustacea: Decapoda: Caridea), with description of a new species from East Asian waters. *Zootaxa*, 1684: 1–34.
- Kubo, I. 1951. Some Macrurous Decapod Crustacea found in Japanese waters, with descriptions of four new species. *Journal of the Tokyo University of Fisheries*, 38: 259–289, figures 1–16.
- Leach, W. E. 1814. The zoological miscellany; being descriptions of new, or interesting animals. Vol. 1. E. Nodder and Son, Covent Garden and London. 144 pp., plates 61.
- Liu, R and Zhong, Z 1994. Decapoda. In: Huang, Z (ed.), Marine Species and Their Distributions in China's Seas. China Ocean Press, Beijing. pp. 545–568.
- Liu, R 1955. Economic shrimps from northern China. Science Press, Beijing. 73 pp.
- Martin, J. W. and Davis, G. E. 2001. An updated classification of the recent Crustacea. *Natural History Museum of Los Angeles County, Science Series*, 39: 1–123.
- McNeill, F. A. 1968. Crustacea, Decapoda and Stomatopoda. Great Barrier Reef Expedition 1928–29 Scientific Reports, Vol. 7. Trustees of the British Museum (Natural History), London. 98 pp.
- Miers, E. J. 1879. On a collection of Crustacea made by Capt. H. C. St. John, R. N., in the Korean and Japanese Seas. Part I. Podophthalmia. with an appendix by Capt. H. C. St. John. *Proceedings of the Scientific Meetings of the Zoological Society of London*, 1879: 18–61, Plates I–III.
- Milne Edwards, H. 1837. *stoire Naturelle des Animaux sans Vertèbres, présentant les caractères généraux et particuliers de ces Animaux*. Vol. 5. Paris: J. B. Baillière. 699 pp.
- Miyake, S. and Hayashi, K. I. 1968. Studies on the hippolytid shrimps from Japan, II. Redescription of *Eualus spathulirostris* Yokoya. *Journal of the Faculty of Agriculture, Kyushu University*, 14: 367–371.
- Miyake, S. and Hayashi, K. I. 1966. Some hippolytid shrimp living in coral reefs of the West Pacific. *Journal of the Faculty of Agriculture, Kyushu University*, 14: 143–160.
- Miyake, S. and Hayashi, K. I. 1967. Studies on the hippolytid shrimps from Japan, I. Revision of the Japanese species of the genus *Eualus*, with description of two new species. *Journal of the Faculty of Agriculture, Kyushu University*, 14: 247–265.
- Miyake, S., Sakai, K. and Nishikawa, S. 1962. A fauna-list of the decapods Crustacea from the coasts washed by the Tsushima Warm Current. *Records of Oceanographic Works in Japan (Special number 6)*: 121–131.
- Nakazawa, K. and Kubo, I. 1947. Illustrated encyclopedia of the fauna of Japan. Vol. 2. Tokyo. 5213 pp.
- Nobili, G., 1903. Contributo alla fauna carcinologica di Borneo. *Bollettino dei Musei di Zoologia ed Anatomia comparata della R. Università di Torino*, 18 (447): 1–31, figs. 1–3.
- Noël, P. 1978. *Eualus drachi* nov. sp. (Crustacea, Caridea, Hippolytidae) des cotes française de la Méditerranée. *Archives de Zoologie Experimental et Generale, Paris*, 119: 21–38, figures 1–2.
- Olivier, A. C. 1811. Palaemon: *Palaemon*. In: Olivier, A. C. (ed.), *Encyclopédie méthodique: Histoire naturelle: Insectes*, 8: 652–667.
- Ortmann, A. 1890. Die Unterordnung Natantia Boas: Die Decapoden-Krebse des Strassburger Museums, mit Besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und z. Z. im Strassburger Museum aufbewahrten Formen, I. *Zoologische Jahrbücher Abtheilung für Systematik, Geographie und Biologie der Thiere*, 5: 437–542, plates 36, 37.
- Owen, R. 1839. Crustacea. In: *The Zoology of Captain Beechey's Voyage; Compiled from the Collections and Notes Made by Captain Beechey, the Officers and Naturalist of the Expedition, during a Voyage to the Pacific and Behring Straits Performed in His Majesty's Ship Blossom, under the Command of Captain F. W. Beechey, R. N., F. R. S., & c, in the Years 1828, 26, 27, and 28*, pp. 77–97, plates 24–28.

- Parisi, B. 1919. I Decapodi Giapponesi del Museo di Milano, VII: Natantia. *Atidella Societa Italiana di Scienze Naturali*, 58: 59–99, figures 1–8, plates 3–6.
- Poore, G. C. B. 2004. Marine Decapod Crustacea of Southern Australia. A Guide to Identification with Chapter on Stomatopoda by Shane Ahyong. CSIRO Publishing, Melbourne. pp. 118–126.
- Rafinesque, C. S. 1814. Précis des Découvertes et Travaux Somiologiques de Mr. C. S. Rafinesque-Schmaltz entre 1800 et 1814 Ou choix raisonné de ses principales Découvertes en Zoologie et en Botanique, pour servir d'introduction à ses ouvrages futurs. Royal Typographie Militaire, Palerme. 56 pp.
- Rafinesque, C. S. 1815. Analyse de la Nature, ou Tableau de l'Univers et des Corps Organisés. L'Imprimerie de Jean Barravecchia, Palermo. 224 pp.
- Rathbun, M. J. 1902. Japanese Stalk-eyed Crustaceans. *Proceedings of the United States National Museum*, 26: 23–55, figures 1–24.
- Rathbun, M. J. 1906. The Brachyura and Macrura of the Hawaiian islands. *Bulletin of the Bureau of Fisheries*, 23: 827–930, plates 1–24.
- Risso, A. 1816. Histoire naturelle des Crustacés des environs de Nice. Librairie Greque-Latine-Allemande, Paris. 175 pp., 3 plates.
- Roux, P. 1831. Memoire sur la classification des Crustacés de la tribu des Salicoques. Marseilles. 39 pp., 4 tables.
- Sarato, C. 1885. Études sur les Crustacés de Nice, Ligur Edwardsii, Nob. *Le Moniteur des Étrangers A Nice*, 222: 1–3.
- Sowerby, J. 1804–1806. The British Miscellany: or coloured Figures of New, Rare, or little known Animal Subjects; many not before ascertained to be Inhabitants of the British Isles; and chiefly in the Possession of the Author, pp. i–vi, 1–137, plates 1–76.
- Stebbing, T. R. R. 1915. South African Crustacea. Part VIII of S. A. Crustacea, for the Marine Investigations in South Africa. *Annals of the South African Museum*, 15: 57–104, plates 13–25.
- Stebbing, T. R. R. 1921. Some Crustacea of Natal. *Annals of the Durban Museum*, 3: 12–26, plates 1–5.
- Stimpson, W. 1860. Crustacea Macrura. In *Prodromus descriptionis animalium vertebratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit, part VIII. Proceedings of the Academy of Natural Sciences of Philadelphia*, 1860: 22–47.
- Thallwitz, J. 1891. Über einige neue indo-pacifische Crustaceen (Vorläufige Mittheilung). *Zoologischer Anzeiger*, 14: 96–103.
- Thallwitz, J. 1892. Decapoden-Studien, insbesondere basirt auf A. B. Meyer's Sammlungen im ostindischen Archipel, nebst einer Aufzählung der Decapoden und Stomatopoden des Dresdener Museums. *Abhandlungen und Berichte des Königlichen Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden*, 3: 1–56, 1 plate.
- Urita, T. 1921. Studies on the shrimps and their distribution in Kagoshima Prefecture. *Dobutsugaku Zasshi*, 33: 214–220.
- Urita, T. 1942. Decapod Crustaceans from Saghalien, Japan. *Bulletin of the Biogeographical Society of Japan*, 12: 1–78.
- White, A. 1847. List of the specimens of Crustacea in the collection of the British Museum. British Museum, London. i–viii, 143 pp.
- Xu, P and Li, X-Z 2014a. *Eualus heterodactylus* sp. nov., a new hippolytid shrimp from Chinese coast of the Yellow Sea (Crustacea, Decapoda, Caridea). *Chinese Journal of Oceanology and Limnology*, 32(6): 1339–1343.
- Xu, P and Li, X-Z 2014b. A new species of the hippolytid shrimp genus *Thor* Kingsley, 1878 (Crustacea: Decapoda: Caridea) from Hainan Island, China. *Zootaxa*, 3795: 394–400.
- Yang, H. J. and Kim, J. N. 2005. New record of *Heptacarpus jordani* (Crustacea: Decapoda: Hippolytidae) from Korea and redescription of *Heptacarpus geniculatus*. *The Korean Journal of Systematic Zoology*, 21(1): 11–19, figs. 1–2.
- Yokoya, Y. 1930. Report of the biological survey of Mutsu Bay, 16: Macrura of Mutsu Bay. *Science Reports of the Tohoku Imperial University*, series 5: 525–548, figures 1–5, plate 16.
- Yokoya, Y. 1933. On the distribution of Decapod Crustaceans inhabiting the continental shelf around Japan, chiefly based upon the materials collected by S. S. Soyo-Maru, during the years 1923–1930. *Journal of the College of Agriculture, Tokyo Imperial University*, 12: 1–226, figures 1–71.
- Yokoya, Y. 1939. Macrura and Anomura of Decapod Crustacea Found in the Neighborhood of Onagawa, Miyagi-ken. *Science Reports of the Tohoku Imperial University*, series 4, Biology, 14: 261–289, figures 1–13.